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# WOODWORKER'S JOURNAL

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## Murphy Bed



**Memory Clock**  
Page 68



### INSIDE:

- Shoe Cabinet
- Bathroom Vanity
- Veneering 101
- Are Your Tools Getting Smarter?

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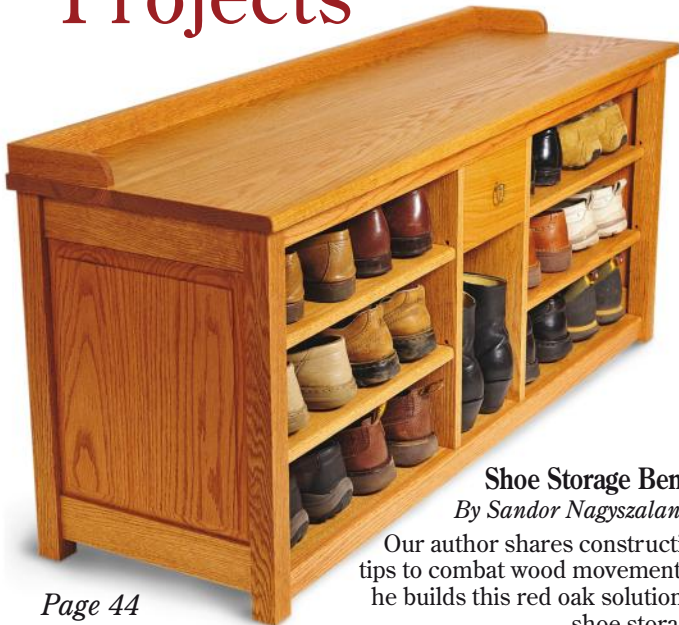
# Woodworker's Journal

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By Sandor Nagyszalanczy

Our author shares construction tips to combat wood movement as he builds this red oak solution to shoe storage.



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### Bathroom Vanity

By Anatole Burkin

False drawer fronts camouflage the three graduated drawers (cut to fit your plumbing) in this modern style vanity.

### Murphy Bed

By Bruce Kieffer

New Murphy bed hardware makes this space-saving fold-up bed (with optional side cabinets) an attractive addition for any home.

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### Thinking-of-you Clock

By Kimberly McNeelan

Keep track of your loved ones' time zones with this project's multiple clock faces, leave yourself reminders on the chalkboard insert, and find a space to never lose your keys again.



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— Dan Cary





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WoodWorkers Guild of America  
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# Letters

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APRIL 2017

Volume 41, Number 2

## On the Home Front



### WOODWORKING FOR YOUR HOME

Most woodworkers do home improvement work. It's just who we are. And, while most of us would not choose to call ourselves "DIYers" as the term has come to be known on cable TV shows, we are indeed "Do It Yourself" folks in the truest sense. If I need a new wall or cabinet in my house, there is a 99% chance that I will be building it.

Which brings me to this issue of the magazine. Two of the projects, the bathroom vanity and the Murphy bed, are great examples of using woodworking skills to enhance your home. Trends change in kitchen and bathroom cabinetry — with that in mind, Anatole Burkin's new vanity is a beautiful modern upgrade. And speaking of trends, Murphy beds are hot right now, so we asked our old friend Bruce Kieffer to build us an "on trend" version using some new, more inexpensive hardware. It is easy to build and could be just the ticket for making more effective use of that spare room in your home.

Our Weekend Project is another home front winner. If your family is like mine, you have folks scattered across the county, or even the world, living in different time zones. Kimberly McNeelan builds a clock that can help us keep track of our loved ones and know when (and when not) to call them (my brother in California just loves it when I call him at 5 a.m.).

So here is to some home improvement, woodworking style!

— Rob Johnstone

### Chair Changes

I built the chair shown in the October 2016 issue ["Making Shaker Work Chairs"]. As I no longer have a lathe, I decided to make the parts square or rectangular as you can see in the photo. I cut the inner surfaces of the legs at a 10° angle to allow the spreaders to align correctly. All parts are made of pine. I used a piece of denim for the seat material as the webbing would have been quite expensive. It was a fun project. It's a cute chair.

Bill Miller  
Buffalo Grove, Illinois



**Reader Bill Miller made some changes to our chair project.**

The real reason cannonballs bounced off the U.S. Constitution's sides was that the live oak timbers used to build her were green, unseasoned wood.

*Continues on page 10 ...*

### Ole Ironsides' Wood

In reference to the item in the December 2016 *Hey, Did You Know?* column:

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## Letters continued



The British had already denuded the American Colonies of old-growth white and red oak, and the newly independent United States needed frigate ships *now*!

Southern (jack) pine trees made straight, flexible masts and yardarms as well as providing pitch and turpentine spirits. All of these materials were considered "naval stores," and the colonists were forbidden to sell them to countries other than Britain.

After 240 years, those same live oak timbers would probably have trouble bouncing a high-speed marble (not that anyone would dare to try). If you have a chance to visit Boston, "Ole Ironsides," afloat in Boston Harbor, is a beautiful display of the master craftsman's art. To touch that wood is a history lesson in itself. (I always hope that a little of that craftsmanship will soak into my fingertips.)

Bob Pittelkow  
Bloomington, Minnesota

### Pressure vs. Force

I'm a long-time reader of WJ, and I've noticed that advertisers are losing sight of the distinction between pressure (force per unit area) and force (just force) when talking about clamps.

For example, the ad for the excellent Piher "Max-i-pher" clamp says it can apply a maximum pressure of 2,250 lbs. I suspect that it is really a maximum *force* of 2,250 lbs. Spread over five square inches, that would be 450 pounds per square inch, which is still a lot of pressure, certainly adequate for most woodworking, and maybe enough to make plywood or MDF.

Tom O'Brien  
San Antonio, Texas



### Oldie But Goodie

I was going through past issues of *Woodworker's Journal* and decided to build your "Recycled Cabinet" in the February 2014 issue. I can't class mine as recycled, however, as I used 3/4" pine for the sides and 2x6" pine for the front, as this was easier to get. I got an old casement window from a local antique/junk store. Finished the project with Minwax Gunstock stain, coated with poly, and the back slats with shellac. The finished piece looks "antiquey" to me, and I'm using it for an entertainment cabinet in the basement.

E.J. Emery  
Mount Ida, Arkansas



*E.J. Emery cut an opening in the back slats of our Recycled Cabinet plan for his TV receiver.*

### Finesse the Fulcrum

I spent 30 years teaching mathematics to middle school and high school students as well as members of a woodworkers guild. In the December 2016 issue, I noticed what I consider a common geometric error concerning angles, specifically trapezoids or isosceles trapezoids. In the article "3 Kitchen Doo-dads/ Toasty Tongs" by A. J. Hamler, he describes how to make the fulcrum for

*Continues on page 12 ...*



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Nathan Wiens  
Artist & proprietor, Chapel Arts  
Master woodworker  
Vancouver



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## MORE ON THE WEB

Check online for more content covering the articles below:

**Stumpers (page 18):** Vintage horsedrawn grain binder in use (video)

**Shop Talk (page 20):** PORTER-CABLE Restorer surface preparation tool in action (video)

**Woodturning (page 24):** Riving green wood for turning spindles (video)

**Murphy Bed (page 28):** Overview and benefits of Rockler Murphy bed hardware (video); Material Lists for twin and full-size Murphy beds (PDFs)

**Shoe Storage Bench (page 44):** Steps to assemble a shoe storage project (video)

**Technology & Woodworking (page 52):** Introduction to tools which use mobile device apps (video)

**Weekend Projects (page 68):** Using a keyhole bit; routing a square hole with a jig (videos)

**What's in Store (page 76):** Rockler Miter Fold Dado Set and other featured tools in action (videos)

**Finishing Thoughts (page 82):** Brushing on varnish and cleaning the brush (video)



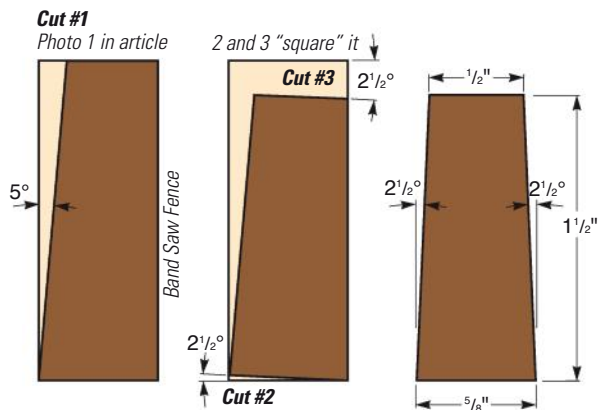
the tongs. He also shows a photo of the method used to cut the fulcrum with a band saw along with a drawing of the top view of the fulcrum desired (both on page 51).

The author states: "I only made a single 5° cut, but once you square the ends when cutting the wedge to width and length, it evens out to 2½° on each side." I'm sorry, but this cannot ever happen. What the author produces by making this 5° angle cut on only one side of the block of wood shown is a trapezoid with two 90° angles on the side against the fence and an 85° and 95° angle on the cut long side. No matter which side or edge is then placed on the table or against a crosscut guide, one cannot square the ends without maintaining this figure. Thus, one cannot change a 5° cut on one side into two 2½° angles with one on each long side of the block.

Clark D. Schultz  
Wichita, Kansas

**WJ Responds:** Mr. Schultz is right that you can't literally change a 5° angle on the side of a trapezoid to another angle — I just changed the orientation of the trapezoid. I did a quick sketch:

In part (1) of the sketch above is my original cut of



A.J. Hamler sketches out the math of angles created when he cut a trapezoid as part of the "Toasty Tongs" project.

the workpiece on the band saw: a trapezoid with two 90° edges against the fence. In part (2) of the sketch I've "squared" the workpiece vertically by trimming the bottom so it sits squarely vertical. It's still a trapezoid, but it's now tilted to the left by shaving off that tiny little bit, creating the vertical profile of the fulcrum. Because that cut makes the trapezoid symmetrical vertically, that 5° angle on the left lost 2½°, making that side 87½° from vertical. Meanwhile, the 90° face that was against the fence also tilted 2½° from vertical, also making it 87½° degrees. The angles in those corners then become 2½° each.

"Cut 3" in part (2) of the sketch simply squares the top of the fulcrum at the same time it cuts it to length. The result is the fulcrum in part (3) of the sketch, which matches the drawing accompanying the article — the "top view" of the fulcrum if you laid the Toasty Tongs down on the table.

— A.J. Hamler

his shop vac. In the picture, the pleated filter would be installed over the fan cage. However, adding a vacuum bag would serve no purpose other than making it a little easier to empty. A plastic trash bag would work the same and be a whole lot cheaper. But neither will eliminate the need for a filter over the fan.

Dave Hulett  
Hot Springs, Arkansas

**WJ Responds:** You couldn't use a plastic bag the same way as the filter bag, because air can't pass through it. If you connected a plastic bag



to the tank inlet, the vacuum's motor would rip it off and then start sucking air. The bag would probably then get wound around the impeller blade and make a huge mess inside the motor.

The vacuum bag is designed to be both a container for the vacuumed debris and a giant filter. That's why the round pleated filter isn't necessary when using the bag.

— Chris Marshall



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## Enlightening Tips for Your Shop



### Easier-opening Spring Clamps

While building a summer project with my teenage granddaughters, they found my 2" spring clamps difficult to squeeze open. So I devised this simple modification to make the clamps easier to use. I installed a 1/4"-20 carriage bolt into a pair of holes I drilled through the handles, then added a washer and a knob. Now the girls can simply twist the knob to open the clamps, or squeeze the handles and adjust the knob to hold the open setting. Loosening the knob closes the clamp. I think anyone with limited grip strength will appreciate this convenience.

Jim Moorehead  
Barrigada, Guam



### Simple Scroll Saw Resawing

Here's how I resaw small stock into thinner pieces at my scroll saw. I clamp my workpiece standing on edge to a 2" x 2" scrap block that's long enough to support the wood and clamp. Leave a little space between the back edge of the wood and your C-clamp for the blade to exit the cut. Now, just push the assembly through to make the resaw cut following your layout line.

Dale Miller  
Modesto, California

### Clamp-on Workbench Storage Trays



These little 9" x 3" plastic organizer bins sure are handy to have around the shop, and you can find them at hardware or home decor stores. To make them even more useful, I screw a piece of 3/4" scrap to one side of the bin, then fasten a longer strip of hardboard to the top of the scrap. Now

I can clamp these trays by their hardboard "ears" close to wherever I'm working. They're great for holding small tools, fasteners or other supplies.

John Stahr  
Chicago, Illinois

### Masking Around Dowels or Plugs with Scrap Metal

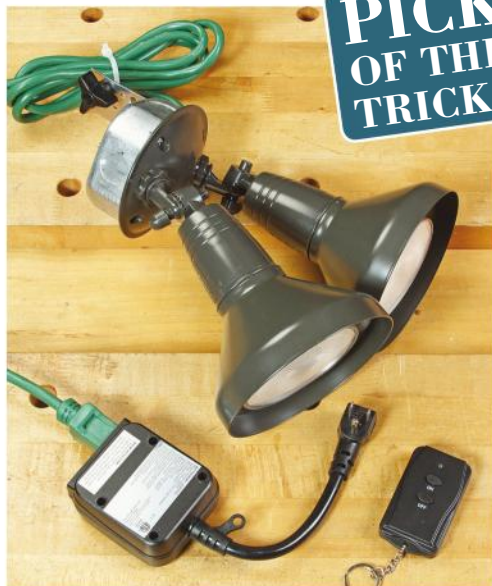
When I'm installing dowels or plugs to fill screw holes, here's how I prevent glue squeeze-out from soaking into the surrounding wood. I drill a hole the same diameter as the dowel or plug through a piece of thin scrap metal, and I tape it down in place after aligning it over the hole. Then I spread glue in the hole, install the dowel and tap it home. Any squeeze-out that rises out of the hole around the dowel or plug ends up on top of the metal. Once the glue sets a bit, I lift the metal mask off to remove the excess glue. You can sand the metal around the rim of the hole until it's razor-thin, which makes this trick work even better!

Paul Guncheon  
Wahiawa, Hawaii





## PICK OF THE TRICKS



### DIY Shop Lighting

Recently I decided to do something about my poor garage shop lighting. I purchased an electrical box, double flood lamp holder, an extension cord and a remote-controlled On/Off switch. I assembled them into the rig you see

here and bolted an "L" bracket on the back for mounting purposes. I installed two 5,000K LED flood lamps and mounted the light on the steel bracing that supports my garage door opener (GDO). With the remote switch plugged into the GDO's outlet, I can turn this light on and off from anywhere in the shop with the remote control. I've aimed the light at my assembly table. The raking angle really helps me see the imperfections in my assembly and finishing processes while brightening up a dark space.

Gerald Welf  
Fridley, Minnesota

### Safety First

Learning how to operate power and hand tools is essential for developing safe woodworking practices. For purposes of clarity, necessary guards have been removed from equipment shown in our magazine. We in no way recommend using this equipment without safety guards and urge readers to strictly follow manufacturers' instructions and safety precautions.

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# Questions & Answers

## Composite Lumber: For the Birds?

### THIS ISSUE'S EXPERTS

**Dr. Jim Randolph, DVM**, is a veterinarian practicing in Mississippi who regularly blogs at [www.mypetsdoctor.com](http://www.mypetsdoctor.com).

**Michael Dresdner** is a nationally known finishing expert and author of *The New Wood Finishing Book*.

**Rob Johnstone** is the publisher of *Woodworker's Journal*.

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**Q** We have some leftover composite lumber from a deck. I was planning to use it for birdhouses. Do you recommend composite lumber for birds, or is it harmful?

Lavern Farmwald  
Grayson, Kentucky

**A** Weighing durability and safety, the balance tips substantially to a "no" answer.

Composite lumber, which is wood fiber mixed with recycled plastic, bound with glue, gets high points for durability. The birdhouse you make from scraps will probably last as long as the deck, bench or table you fashioned.

The Massachusetts Audubon Society expresses

concern that non-wood products, specifically metal and plastic, are considerably more dense than common domestic wood species and lack the breathability of wood. That interference with natural air and water vapor movement could lead to a moist environment, resulting in fungus, mold and associated respiratory conditions. High heat and humidity are especially dangerous to young birds.

Noted local wildlife veterinarian Dr. James Askew expressed concern to me about the binders used in composites. Not only could chemicals leach into the living area, but birds inclined to customize their houses by pecking might accidentally ingest chemicals and/or plastic.

— Dr. Jim Randolph, DVM

**Q** Enjoyed your December 2016 issue and in particular the advice for finishing kitchenware [*Finishing Thoughts*, "Coatings for Kitchenware"]. However, I was left with an unanswered question that

I have been pondering for some time: What finishes do you recommend for use on a coffee cup? Given the relatively high temperatures involved and the somewhat acidic character of the coffee, I have found it difficult to find a satisfactory answer to my question.

Buzz DeHooghe  
Elmira, Michigan

**A** There's a good reason you don't see a lot of wooden coffee cups.

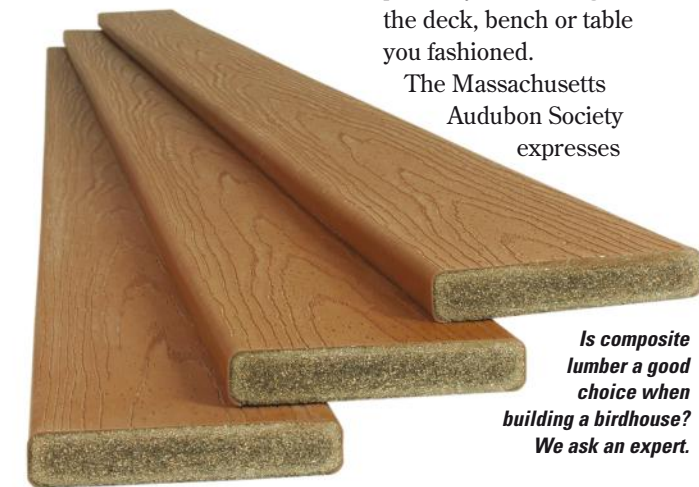
Few finishes will hold up to the assault a ceramic cup easily tolerates. In fact, even the wood itself won't do very well against the moisture, heat, abrasion and stains a coffee cup must endure.

Your best bet is to first impregnate the wood with thinned epoxy or polyester, then topcoat with a durable finish. Impregnating wood with one of these plastics will help stabilize it so as to resist movement from moisture. This should give your finish a better chance and may possibly reduce the likelihood of the wood cracking in your wooden coffee cup.

Theoretically, if the epoxy or polyester is smooth enough, you could polish the surface and be done with it. However, I'd advise adding a protective coating once the impregnating resin is cured.

For that, oil-based exterior

*Is composite lumber a good choice when building a birdhouse? We ask an expert.*







**What is a proper finish for a wooden coffee cup? Our expert explains what it is and how to do it — and why he wouldn't.**

polyurethane may be the best option. It's tough, flexible, heat- and chemical-resistant, and fairly stain-resistant. Apply it to the smoothly sanded cup's surface, and you should have something that will last

at least a reasonable amount of time.

Or, you could do what I do: use glass coffee cups for drinking and save the wooden ones for show.

— Michael Dresdner

**Q** O.K., I give up. Why would I adjust the “orbit” on my handheld jigsaw? And furthermore, what is it orbiting around?

M.L. Larabee  
New York, New York

**A** Handheld jigsaws, sometimes called sabre saws, power their blade in an up and down motion. They are extremely handy tools — I used one for years as my “poor man’s band saw” before I could afford a real band saw, as they are adept at cutting curves.

The term “orbit” refers to a somewhat circular movement of the saw blade that you can adjust: no orbit, and



**Winner!**

For simply sending in his question about using composite lumber for bird-houses, Lavern Farmwald of Grayson, Kentucky, wins a Portamate PM-7500 Folding Miter Saw Stand. Each issue we toss new questions into a hat and draw a winner.

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# Stumpers

## Past Tension

*Readers remember past twines.*

### What's This?



Wesley Swartout of Spearfish, South Dakota, suspects this tool was used in a particular industry.

Do you know what it is?

Send your answer to

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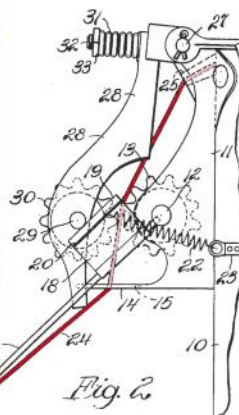
for a chance to win a prize!

### MORE ON THE WEB

For a video of a horsedrawn grain binder in use, please visit [woodworkersjournal.com](http://woodworkersjournal.com) and click on "More on the Web" under the Magazine tab.



Woodworker's Journal editor Joanna Werch Takes compiles each issue's Stumpers responses — and reads every one.



*You get a closer look at the inner workings of our mystery tool in this drawing from a patent filed on a version of the tool in 1931 (U.S. patent 1,964,496).*

In our December 2016 issue, we shared a mystery tool that **Darryl Mickelsen** of Austin, Minnesota, found at an auction. We wonder: was it a farm auction? Read on ...

"The device is a twine tensioner," said **Willard Dahlinghaus** of Minster, Ohio. **Harlen Maier** of Stockton, California, elaborated: "These gears were used on a grain binder and maybe also on a corn binder that a farmer was using."

"The twine to tie the sheaves goes through this to control the tension of the twine," said **Dan Hershberger** of Spickard, Missouri.

**Jerry DeBord** of Brady, Texas, who called it a twine "dog," said, "Binder twine was threaded between the cogs (dogs) from the roll of binder twine. It kept the the twine ready for the arm to catch to make bundles without getting tangled and with the right amount of tension, much like keeping the fishing line between the thumb and forefinger when casting." Jerry went on to reminisce: "As a teenager, I helped make thousands of bundles. I believe I could have replaced or repaired

almost any part on a row binder in the dark."

**Ammon Hoover** of Scottsville, Kentucky, notes that, "In the picture, I can see the hole in the cast frame where the string goes to the rollers, then it runs through the rollers and out a hole on the other side. To increase tension, you screw the nut down on the spring. To decrease, you back it up. I have worked a lot with binders (horsedrawn), and it looks very familiar."

**Reuben Raber** of Millersburg, Ohio, reiterated that the item was meant to feed the twine evenly "as it's drawn through the knoter and needle as it's used to tie bundles of grain or corn sheaves. The twine has a tendency to be curly as it unrolls from the twine 'ball.' This tensioner helps to straighten it out as it feeds into the needle." Reuben's claim to expertise? "I happen to be an Amish farmer as well as a woodworker."



**Winner!** Dan Hershberger of Spickard, Missouri, wins a **RIDGID 18V Stealth Force Pulse Driver Kit (R86036K)**. We toss all the Stumpers letters into a hat to select a winner.

## Questions & Answers

continued

the blade moves straight up and down as it cuts. (Not every handheld jigsaw has an orbit adjustment, but most do.) A high setting for the orbit, and the blade moves



*The "orbit" of a handheld jigsaw blade changes how aggressive the cut is but sacrifices cut quality.*

in a straight line down and rotates backward when it is at the lowest point in its stroke. Because jigsaws cut on the up-stroke, this change makes the cut more aggressive and faster — especially in thick material. It also is a bit more efficient at removing sawdust. The tradeoff is that the cut will usually be rougher — with more chips and saw marks on the face of the material.

So why would you adjust your orbit? If you are cutting thin stock, or want a smoother cut in, say, thick hardwood, zero or less orbit is your best bet. If you want to cut faster with less effort in thick material, but are not as concerned about the quality of the cut, more orbit is better. As to what your saw is orbiting around ... the sun, just like the rest of us.

— Rob Johnstone



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# Shop Talk



*Marco Terenzi makes miniature woodworking tools, such as this 3½"-long jack plane.*



In addition, in order to make his collectible miniature tools, Marco often has to make miniature tools that he will use in the building process. For example, he might need to make a small chisel out of tool steel. "I could have four or five hours into a chisel before I ever start cutting wood with it," he said.

Marco's specialty in miniature things just happens to be miniature woodworking hand tools. Built to 1/4 scale, his tools are not only miniature, but functional — although, he says, he sells them as collectibles: "I don't know if those tiny screws would stand up to daily use."

In his own possession, however, is a jack plane measuring a little over 3½" long that Marco says he uses "all the time. I bring it to shows and let people take shavings with it."

His miniature tools are, indeed, created just like their larger counterparts, with heat-treated tool steel. "They're made the same way as the real ones," Marco said. For the jack plane, which has 16 parts, "It took me five months to make 20. I machined every little screw, everything. I had to make 20 jigs and fixtures to make it. I have to make all the pieces to scale to be able to pull it off; that's what makes it super fun for me."

The people who are buying Marco's tools, he says, divide roughly into two groups: people who have collected miniature tools in the past, and new collectors (often those interested in antique and/or rare tools) who appreciate the time and effort that goes into them. "Since I make less than 20 of everything, mine would be considered rare tools," Marco said. He's not selling to the miniatures world — people who create scenes in dollhouses, for example. The common scale there is 1/12, not Marco's 1/4.

But he has encountered "mostly older guys" who have made miniature tools in the past, and has acquired tips from them, most notably spending a week in the shop of Paul Hamler, who has been making miniature tools since the 1980s. "I'm kind of keeping the craft alive," Marco said.

Since he was a kid, Marco has been interested in how things are made. Also, "I like working with jewelry-size



*An overview of the 16 parts for Marco Terenzi's miniature jack plane, shown with a penny for scale.*

## Maker of Minis: Tiny Tools Work!

After graduating from college with an art degree, Marco Terenzi spent a brief time making large, sculptural items — which would lead, he realized, to "a career path of selling to galleries." At the same time, he was making metal miniatures of his items for fun. "I figured I liked doing it so much, I'm just going to keep making miniature things."



*This photo shows the full set of finished cap irons for the line of 20 jack planes Marco made.*



**Metalworking skills are required to create the miniature woodworking tools: Marco needs to forge hammer heads, chisels and more.**

**Eleven pennies still don't stack up to this ball peen hammer, made from heat-treated tool steel and boxwood.**



things. Making miniatures is a combination of everything I love: small things, tools, woodworking.”

His first introduction to woodworking came as a boy of seven or eight, when he built model airplanes out of balsa wood kits from the hobby store. At age 10, he said, his parents were nice enough to get him a Delta benchtop lathe for Christmas. (He still uses it.) And, during his college “Art Furniture” program, which mostly had a sculptural focus, there was what Marco described as a “crash course” on woodworking.

“I quickly became more fascinated with the tools,” he said. “I like the tools just as much as working with them. With tools, what they’re capable of depends on who’s holding them and using them.”

In his own case, “There’s a balance of making tools to keep and use and ones to sell. In a perfect world, I would only make one or two of each thing and move on, but I have to make a profit. The list of stuff I want to make is about 80 years long.”

Although past miniature tool makers have often focused on replicating rare items, Marco’s interest is in the more commonplace tools. “I just like traditional design,”

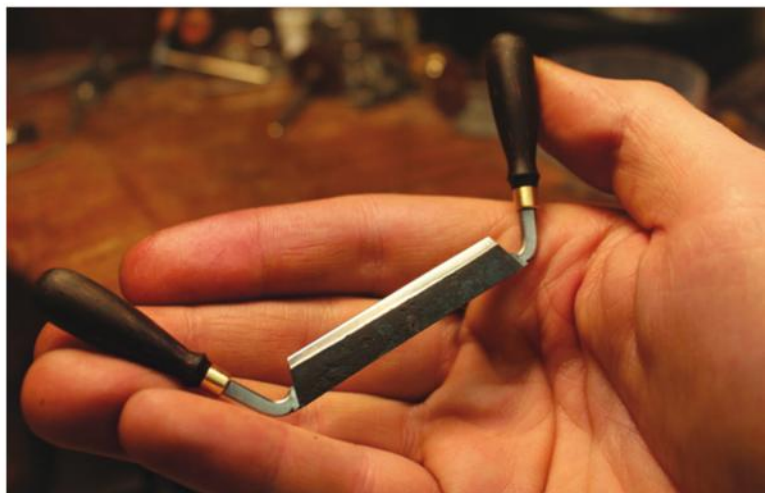
he said. “I do keep up with a lot of the new stuff, and in the future, I want to make more miniatures of tools that are common these days,” he said, like the jack plane, which he describes as “super popular in the last 10 years for the hand tools user.”

When he takes on a project, Marco said he finds encouragement by posting his process on Instagram and receiving supportive comments. “Otherwise, I don’t talk to people,” as he’s ensconced in his shop working, Marco said.

One of his biggest safety concerns, Marco said, is that “The tools I use are super small. I have to watch for eyestrain from looking at something too small for too long. I do use a stereomicroscope for a lot of my work, so I can see it without too much eyestrain.”

“I think the microscope is what got me to the next level,” Marco said, noting that he finds it useful during the finishing process of his tools. Marco’s preferred finish is “shellac, diluted down super-thin, many coats, like a French polish.” He also waxes everything, metal and wood alike, with Renaissance Wax.

And, in fact, a large portion of Marco’s miniature woodworking tools are, indeed



**Marco’s miniature tools, like this drawknife, are built to 1/4 scale — and are fully functional.**

made out of metal, and require his metalworking skills more than woodworking. “I guess I’m more fascinated with the idea of woodworking than the act of it,” he said.

For more of Marco’s work, visit his website at [www.marcoterenzi.com](http://www.marcoterenzi.com).

— Joanna Werch Takes

**This “mini shop” setup includes a variety of functional mini tools, including the saw that’s cutting the wood in the vise.**







*Inventor Robert Kundel, Jr., poses at left with an early, heavy, "Frankenstein" model of his Restorer tool, and the updated production model. Sanding is one of the tool's applications.*

works like a truck tire would throw mud." This means the work surface stays cool, preserving abrasives. "The harder you push in, the deeper you go," into a surface, Robert said.

Realizing the tool could have many uses — "Any roller you put in, you change the applications" — Robert ended up manufacturing it through his own company, Wellington Tool, with a licensing agreement with PORTER-CABLE.

The tool goes through all of PORTER-CABLE's regular testing and is branded with that name, a help in getting retail space, while Robert pays the larger company royalties from product sales.

The Restorer hit store and online shelves last fall in a variety of configurations, with prices ranging between \$99 and \$149. More options, like a buffer and a wire wheel, based on customer requests, are coming.

Eventually, Robert said, a portion of the sales profits will be directed toward another dream of his: "My goal is to make a retreat center for pastors" facing burnout. "The tool is called the Restorer; the retreat center is for restoration; and it says in the Bible [Isaiah 58:12] that Jesus is our Restorer. It all goes hand-in-hand," Robert said.

For more information, visit [www.wellingtontool.com](http://www.wellingtontool.com).

## Tool Solution

Just what the heck is the PORTER-CABLE Restorer tool (you might ask)? From the perspective of the inventor, Robert Kundel, Jr., the answer is: "What *can't* it be?"

Robert originally invented the tool as a solution to the problem encountered at his workplace, Kundel Cranes, of cleaning up dirt and rust around cranes' corners and beams.

"I went home and took my wife's Dirt Devil® vacuum apart. I thought I would just put rollers on" to create a handheld surface prep tool.

After that failed, he purchased a \$20 angle grinder, ripped its gearbox off, and installed it on a metal frame. It "worked amazing on metal," Robert said, and he decided to try it out on the annual refinishing of his patio. "I used it on my patio hand railing, and it stripped it down in seconds to brand-new wood," he said.

Unlike a typical belt sander, which "is so wide that it heats up the surface and makes paint gummy so that it sticks to the sandpaper, and ruins your abrasive," Robert said, the Restorer "tends to flick material off: it

### [www.woodworkersjournal.com](http://www.woodworkersjournal.com) MORE ON THE WEB



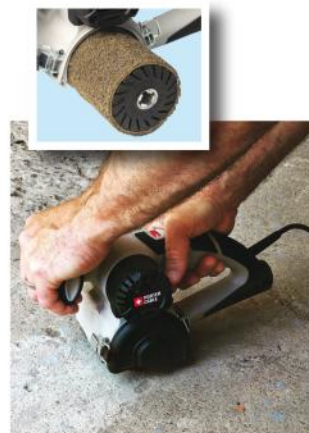
For a video of the PORTER-CABLE Restorer surface preparation tool in action, please visit [woodworkersjournal.com](http://woodworkersjournal.com) and click on "More on the Web" under the Magazine tab.



*A rust and paint remover wheel is one of the options for the Restorer tool. Others include abrasives.*



*Applications include sanding paint and debris off reclaimed wood, or sculpting freeform edges.*



*The tool can attach to a shop vacuum. Robert says you can sand in your home without leaving debris.*



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# Woodturning

## Spindles From “Riven” Green Wood

By Ernie Conover

*Turning spindles from green wood is a time-honored tradition. So is riving blanks from a tree trunk ... our expert explains it all.*



[www.woodworkersjournal.com](http://www.woodworkersjournal.com)  
**MORE ON THE WEB**

 For a video on riving green wood for turning spindles, please visit [woodworkersjournal.com](http://woodworkersjournal.com) and click on “More on the Web” under the Magazine tab.

Almost any woodturner is familiar with turning bowls from green wood. Fewer know that spindles can be turned from green wood as well. Like bowls, it was a common practice before 1850. A commonly accepted factoid is that any spindle turned from green wood will check, or even split, and become unusable. This is not true, however, as long as you do not have a complete annular

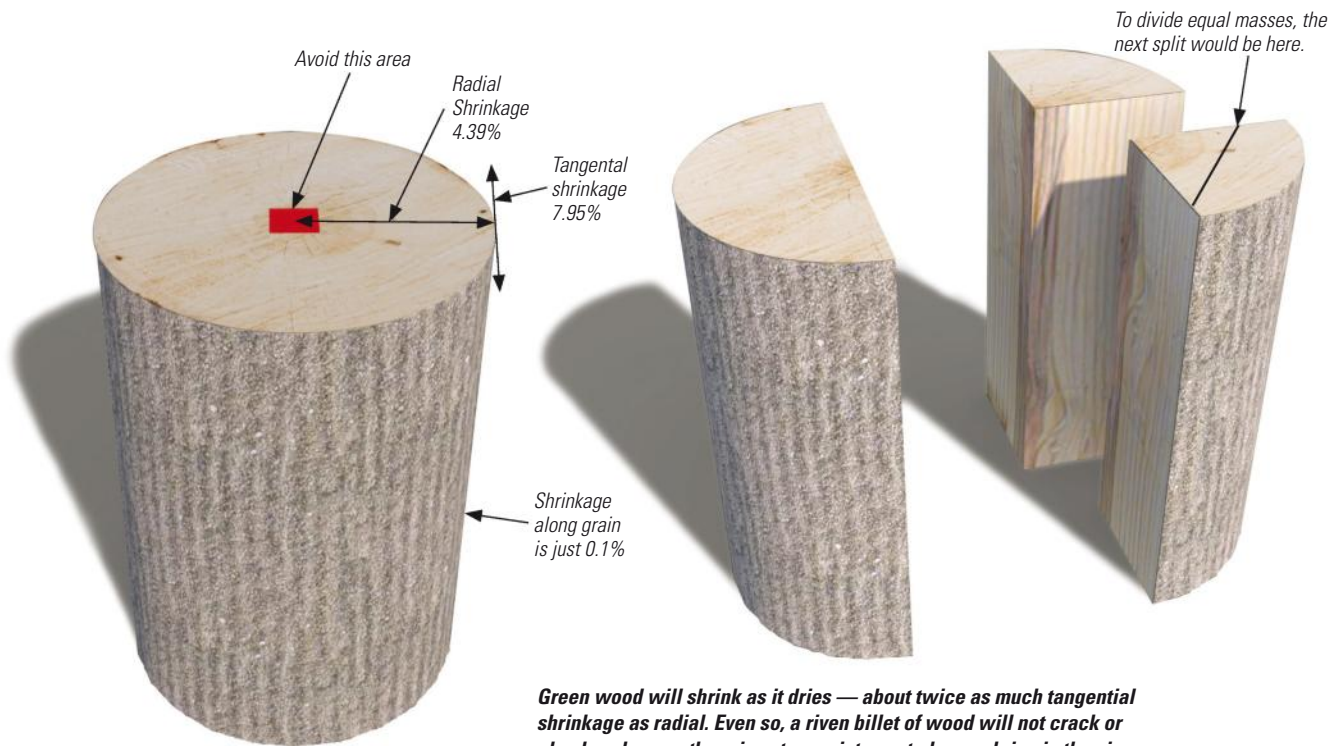
ring anywhere in the billet you turn your spindle from. It is not difficult to gather a billet that does not have a complete annular ring — especially if you do it in the traditional way.

### Wood Shrinks as it Dries

As you can see by the illustration on the next page, a green log shrinks about 4% in diameter, the radial shrinkage; while the loss in circumference is about 8%,

the tangential shrinkage. Left as a log, stress will build around the rings to the point that the wood will check (crack) in one of two ways. Some woods will develop one or two big cracks running the length of the log; others will develop a myriad of small checks throughout the log.

Our forefathers didn't enjoy today's amazing machinery so had to resort to very basic methods of gathering wood. They would



fell a tree of suitable wood, then buck sections of the bole (the trunk between the roots and the first branches) into lengths suitable for the spindles they intended to turn. Unless curly, the bole is clear wood because there are no emanating branches that cause a knot. They then split that section of the trunk into usable sized billets in a process called “riving.”

There is a huge advantage

to riven billets: every grain fiber runs parallel end to end. This makes the resulting turning much stronger than one made from a sawn billet, which often has the grain running out the side. While wood is very strong under compression, it is less so along the grain. The sawn billet will fail completely if it splits along the grain, but the riven one will not. This allowed very dainty propor-

tions in Windsor legs and is why early 18th century examples are still sound today.

Riving wood is quite easy. The first order of business is to find a fresh green log of a workable wood. English Windsor chairmakers used beech, but here in the Colonies we used maple or birch. If you can find trees of these species, they rive nicely and turn beautifully; they showcase the crisp edges

## The Bodgers

Dating back to at least 1700, the bodgers were itinerant English craftsmen living in the beech forests that covered the Chiltern Hills around High Wycombe, a town northwest of London in Buckinghamshire County. They felled the beech trees around their hut, bucked and rived billets from them, then turned Windsor chair spindles on pole lathes. They also wove very sturdy baskets from the green wood. Once they exhausted the trees around their hut, they moved their abode deeper into the forest. The bodgers were a viable trade up into the early 20th century. In modern times, the term bodger has come to mean an inept craftsman; however, the bodgers of High Wycombe were anything but: they were highly skilled turners. They sold their turnings at the town of Windsor, which is how historians believe the chair got its name.



**In this photo taken near Great Hampden, England, around the year 1900, you can see three bodgers working in front of their hut, which contains a pole lathe.**

Wycombe Museum



# Woodturning continued

## Riving a Billet for Turning



**To rive, you must have a sledgehammer and some wedges. Having a froe, as well, makes things easier.**



**Buck a 20" length of a log from the bole of the tree, discarding 6" to 12" of any end that has been exposed to open air for more than a day or two.**



**Split the resulting log length into quarters, then into eighths. Split closer to the outside of the tree (off-center) when dividing the quarters. The idea is to split equal masses of wood with the split running straight.**



**Split each of the eighths into usable billets. At this point, splitting unequal masses can be O.K. since most turnings are tapered once turned. This is where the froe is a great help.**



**A froe, the edged tool with the wooden handle at right, is used to rive wood from a billet. No bodger would leave his hut without one.**

and deep coves typical of the style. You want a log that is from the bole of a straight tree because it will be clear wood, free of knots. Windsor legs require a 20"-long billet, so cut this length from the fresh log. End grain loses water much faster than the rest of the log, which is covered by bark at this juncture. For this reason, the first 6" or so often is checked and should be cut away for firewood.

To rive a few spindles, you only need a sledgehammer and some wedges. For higher production numbers, a froe is a very handy tool. The important thing to remember as you start to rive the log section is some simple physics. To keep all the splits running true, you have to split equal masses. An off-center split will cause the split to run toward the lighter side, for the heavier side transmits more force back into the wedge than the lighter one. This often means placing the wedge or froe off-center on tapered pieces.

Our forefathers would have taken their freshly riven billets to a shaving horse and used a drawknife to take all of the sharp edges off and get them basically round. They would have then turned them to chair legs, stretchers and arm posts in a pole lathe. While it is fun to use the shaving horse and drawknife, thanks to the electric motor in our lathes we can skip this

step if we want to. Just chuck it up and start turning. A good-sized modern spindle roughing-out gouge makes the polygonal billet round in no time at all. You can tell you are round because a continuous ribbon of wood will flow off of a sharp gouge.

The finished spindle will generally have better surface finish than dry wood. Little to no sanding is necessary. As the spindle dries, it will shrink a bit oval and may check for a short distance at each end. Neither affects the utility or strength of the spindle. A dab of green wood sealer on the ends to slow down the rate of water loss from the end grain will virtually negate checking. Once dry, your turning can be sanded and finished in any way you choose. The average viewer will only be able to discern that the spindle is oval by feel. Visually, they look like any spindle.

Spindle turning some green wood is a fun exercise in confidence building. That great stream of shavings coming off any of the tools is a large part of it, I think. It allows a beginner to take risks that they would not take with dry wood. It is a fantastic way to teach children. Give it a try!

*Ernie Conover is the proprietor of Conover Workshops. He is the author of The Lathe Book and The Frugal Woodturner.*



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# Murphy Bed

By Bruce Kieffer

*Save floor space without sacrificing comfort in this handsome bed project. A new hardware kit from Rockler makes it easy.*



Legend has it that William Lawrence Murphy, who invented and patented the first fold-up Murphy bed around 1900, designed it in order to turn his one-room apartment into a presentable parlor to woo an opera singer. It enabled her to enter his living

quarters but not his bedroom, which was frowned upon at the time. While social mores have changed since then, the practicality of a fold-up bed has not. When raised for storage, it takes up a fraction of the space of a traditional bed frame. And when called into use, it of-

fers “real” bed comfort and support that you or your guests will appreciate!

Most Murphy bed designs these days require a wooden box to capture the mattress (no box spring is used). My design is super simple and eliminates a lot of the work involved with building

one of these other styles. The key is a complete hardware kit from Rockler that includes a metal bed frame with a pneumatic lift system and a wooden slat platform that acts like a box spring. If you decide to build one or both of the side cabinets shown here, this project offers plenty of additional shelf and cabinet storage, too.

I made my queen-size Murphy Bed using birch lumber and birch plywood because its tight grain is great to paint. And to that end, you'll see later that I've applied "modern" milk paint (no milk required!) to the birch, followed by two coats of clear flat (sheen) water-based finish to add durability and luster. But if you'd prefer a "natural" wood look instead, or want to match this project to existing trimwork, any species and finish will be good substitutes for birch. It's up to you.

Of course, not everyone needs a queen-size bed, so material lists for twin and full-size beds are available in the "More on the Web" online content for this project. Rockler sells twin- and full-size Murphy Bed hardware kits as well.

## Construction Notes

In addition to the usual woodworking machines and router bits, to build this bed you'll also need a pocket-hole jig, biscuit joiner and a few other specialized items: a 35 mm drill bit, shelf pin drilling jig and an inset hinge baseplate drilling jig. You'll also need a dozen or so 18" bar clamps, a few 7' pipe clamps and at least 20 medium-size Rockler Bandy Clamps or other three-way edge clamps if you want to speed up clamping the edging strips to the plywood.

Here's a rough account of sheet goods, wood and molding you'll need: for the bed cabinet, buy four full sheets of 3/4" plywood, 30 board feet of birch and 10 lineal feet of 4 1/4"-wide crown



**Glue and clamp the 3/4"-thick edging pieces to the bed cabinet plywood. Place bar clamps at 6" intervals. Clean up wet glue squeeze-out with a rag, and scrape the rest away after it has cured.**



**Glue and clamp the 1/8"-thick edging pieces to the edges of the upper and lower back panels. A bunch of Rockler medium-size Bandy Clamps makes quick work of this task. Push them down as hard as you can to apply maximum pressure for tight glue joints.**

molding. Each of the side cabinets will require one full sheet of 3/4" plywood, one 2' x 8' half sheet of 1/4" plywood and 3 board feet of birch.

While this is a large project, it's not hard to build. However, it does require a big workspace when you get to the pre-finish assembly of the bed cabinet and frame. A one-stall garage or similarly sized workshop should be enough space to tackle this project. I've designed the bed cabinet to be knockdown, because it's so large that in almost every instance it would be too big to maneuver from your shop into the room where it will be mounted. You'll

use biscuits (no glue) to align most of the joints and pocket screws to assemble the knockdown parts.

Be prepared to cut away baseboard where you plan to mount the bed and side cabinets to your wall. Also, aside from being dangerous if not mounted securely to wall studs, the bed will not function properly either. You must use the "bed-to-wall" brackets included in the hardware kit.

## Assembling the Bed Cabinet

Let's get started by cutting the bed cabinet box pieces 1 through 5 to size, according to the *Material List* dimen-





**Cut the biscuit slots in the bed cabinet sides for joining the top, bottom and backs. The biscuits will keep the joints aligned when pocket screws are inserted.**



**Drill the pocket screw holes using a pocket-hole jig. Bore two side-by-side holes at the front edges, as shown here, for increased holding power where it matters most.**

sions on the next page. Now rip and crosscut thin strips of solid stock for the edging (pieces 10 through 12), and glue and clamp it to the cabinet's exposed plywood edges. Use bar clamps to secure the 3/4"-thick edging and Bandy Clamps or other three-way edge clamps for the 1/8"-thick edging. Once these glue joints dry, use a sander to bring the edging flush to the plywood faces.

Now pull out your biscuit joiner and cut #20 biscuit slots in the ends of the top, bottom and back pieces. Lay out the mating slots for those you've just made on the inside faces of the side panels, and cut these slots, too. All of these biscuit locations will help align the parts during final assembly, but they aren't what actually holds the joints together. For that, we'll use pocket screws. Drill

the pocket screw holes on the ends of the top, bottom and back pieces. You'll also need screw holes along the rear edges of the top and bottom panels to join them to the upper and lower back pieces.

Take the cabinet side panels over to your drill press to bore 3/8"-dia. x 1/2"-deep holes for the bed frame mounting plates' threaded inserts (see *Drawing*, next page, for their locations). The inserts will stand proud of the face of the plywood. Once those are done, finish-sand the inside faces of the sides, then drive in the threaded inserts. Attach the two mounting plates with the wafer head hex drive bolts provided in the kit.

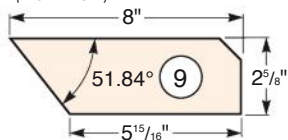
That done, it's time to put some pieces together! Go ahead and dry-assemble (no glue) the bed cabinet box using biscuits, flathead screws and pocket screws. Install the cleat (piece 18) inside the bed cabinet's top panel by screwing that in place. You can also assemble the bed frame, following the instructions included in the hardware kit. Now round up a helper so you can test the frame's fit in the bed cabinet. Review how the pistons mount, but don't attach them yet.

### **Adding a Crown**

Measure the overall top of the bed cabinet so you can cut the crown panel (piece 7) to size, but don't install it now. Instead, we'll cut the three pieces of crown molding (pieces 8) to fit around its front and sides, while this panel is still easy to reach. If you've never installed crown before, or if it's been a while, take a deep breath and pause. The last thing you want to do is mess up these cuts and waste some expensive crown molding. The simplest way

### Crown Brace

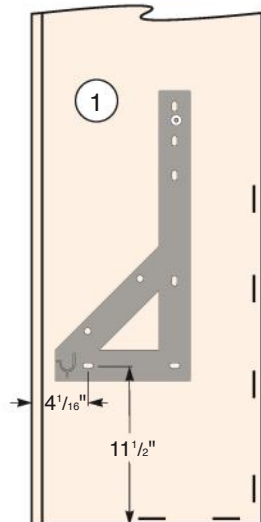
(Front View)



**NOTE:** Follow the assembly instructions provided with the Murphy bed hardware. Woodworker's Journal used their step-by-step procedure when building this bed.

### Mounting Plate Location

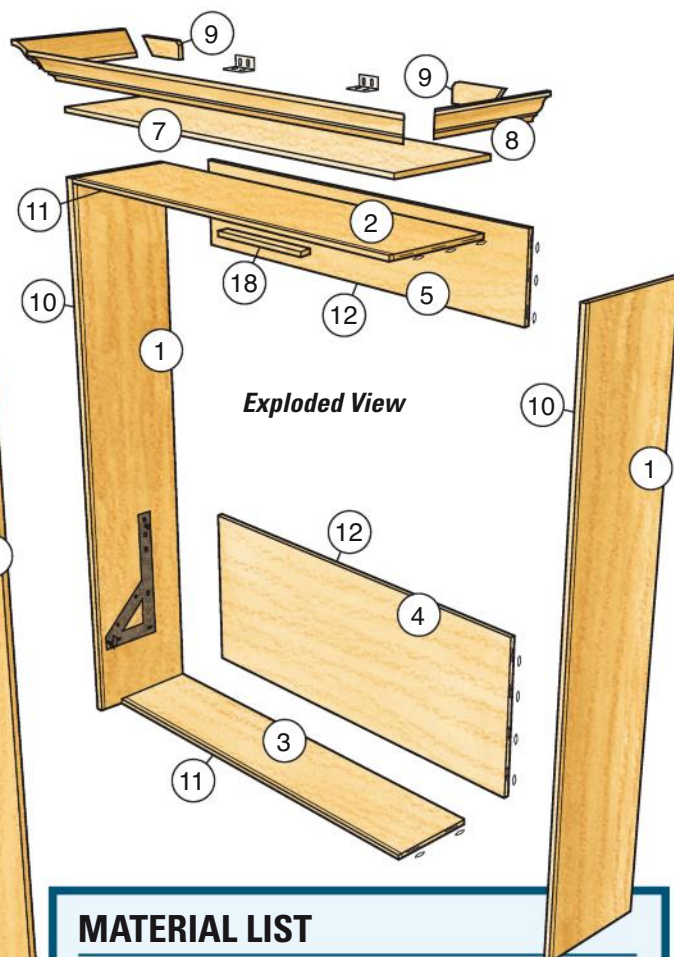
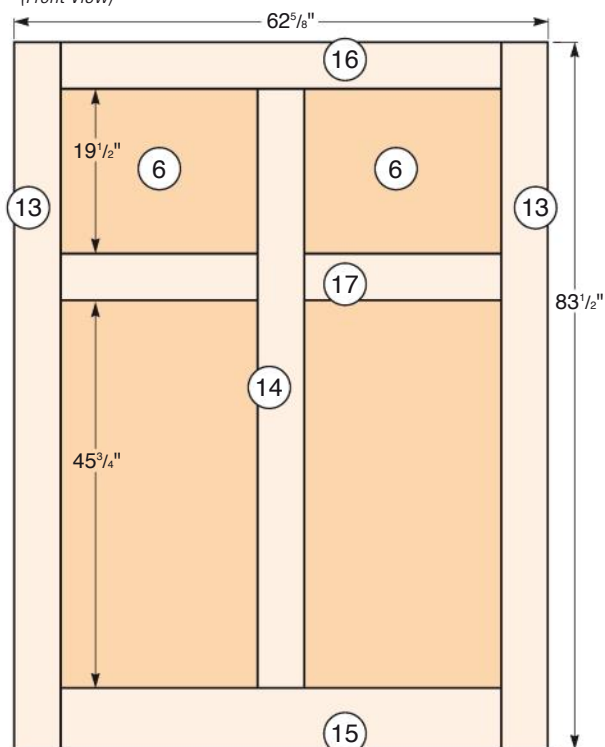
(Inside View)



**NOTE:** The threaded inserts for the mounting plates are 9/16" long. The holes drilled for the inserts are 1/2" deep. The inserts will stand proud of the face of the plywood.

### Bed Frame Door

(Front View)



## MATERIAL LIST

### Bed Cabinet (queen size)

	T x W x L
1 Sides (2)	3/4" x 15 7/8" x 85 1/2"
2 Top (1)	3/4" x 15 7/8" x 63 5/16"
3 Bottom (1)	3/4" x 12 7/8" x 63 5/16"
4 Back, Lower (1)	3/4" x 25 7/8" x 63 5/16"
5 Back, Upper (1)	3/4" x 12 7/8" x 63 5/16"
6 Door Panels (2)	3/4" x 31 5/16" x 83 1/2"
7 Crown Panel (1)	3/4" x 16 7/8" x 64 13/16"
8 Crown Molding	1 1/16" x 4 1/4" x 10 ln. ft.
9 Crown Braces (2)	3/4" x 2 5/16" x 8"
10 Edging (2)	3/4" x 3/4" x 85 1/2"
11 Edging (2)	3/4" x 3/4" x 63 5/16"
12 Edging (2)	1/8" x 3/4" x 63 5/16"
13 Side Trim (2)	3/4" x 5 1/2" x 83 1/2"
14 Center Trim, Vertical (1)	3/4" x 5 1/2" x 70 3/4"
15 Bottom Trim (1)	3/4" x 7 1/4" x 51 5/8"
16 Top Trim (1)	3/4" x 5 1/2" x 51 5/8"
17 Center Trim, Horizontal (2)	3/4" x 5 1/2" x 23 1/16"
18 Cleat (1)	3/4" x 3" x 18"

### MORE ON THE WEB



For a video demonstrating the benefits of the Murphy bed hardware used in this project, plus Material Lists for adapting this plan to a twin or full-size Murphy bed, please visit [woodworkersjournal.com](http://woodworkersjournal.com) and click on "More on the Web" under the Magazine tab.





*Drive threaded inserts for the bed frame mounting brackets into the sides of the bed cabinet. Bore clearance holes for them first at your drill press.*



*Assemble the steel bed frame components following the instructions included in the hardware kit. Make sure the joints are flush on the door side of the frame so the door will rest flush against it.*



*Miter-cut the ends of the crown molding pieces. Imagine the saw's fence is the wall, and the table is the ceiling. Here, the author has clamped a stop to the saw so the molding stays oriented correctly.*

to cut the crown's compound-mitered corners is to use a miter saw and set the molding against the saw's table and fence as if they were the corner of a wall and ceiling — pretend the fence is the wall and the table is the ceiling. Rockler sells a jig to help (it's listed on page 35), and there are many online videos that explain the setup. I recommend cutting and fitting the long front piece first, making it a bit oversized and then trimming it to fit. Once it's dialed in for length, you can cut the two side pieces. Glue and brad-nail the crown to the edges of the crown panel. Then make up two braces (pieces 9) to support the crown from behind. Attach them with more brads and glue. With this work done, position the crown and pre-drill for its attachment screws.

### **Making the Bed Frame Door**

When the bed is stored upright, its frame is concealed behind a paneled door, which we'll build next. Do that by cutting the two main panels (pieces 6) to size. Now rip and crosscut the door's trim (pieces 13 to 17) from solid stock. Lay out and cut biscuit joints to dry-assemble these trim pieces into a divided frame. Attach the door panels to the back of the frame with countersunk flathead wood screws. Once the door is put together, your tape measure will show you that the margins between its final size and bed frame are intentionally generous: there will be between 1/4" and 5/16" gaps on the sides and top. The bottom gap to the floor will be 1 1/8". These margins will ensure good clearance when the bed is opened or closed.

Wrap up the bed cabinet construction by making the cleat (piece 18), but don't install it in the bed cabinet now — we'll do that during final installation. Ease all exposed sharp edges of the door and bed cabinet with a sanding block,



**Cut the biscuit grooves that join the sides of the side cabinets and dividers. Align and clamp the pieces like this, and then cut the grooves in the divider ends. Do not unclamp anything yet.**



**Now orient the biscuit joiner upright and align it to the drawn marks and cut the grooves in the sides. Rest the joiner's base against the clamped divider and mill the slots in the side panels.**

then disassemble the door and cabinet and finish-sand their exposed faces and edges to 150-grit.

### Building the Side Cabinets

With this design, you can build one or both side cabinets based on your needs and available space. They attach to the bed cabinet with hidden screws driven through pocket screw holes drilled in their top panels, and by adding more screws under the divider and behind the cabinet doors.

Start by cutting the plywood components (pieces 19 to 23) to size. Make the birch edging (pieces 27), and glue them to the exposed edges of the appropriate parts. Then use a 1/4" rabbet bit, or a straight bit and fence to rout the 1/4"-

wide x 1/2"-deep rabbets along the rear edges of the side panels to house the back panels.

Next, lay out and cut biscuit joints to connect the tops, bottoms, dividers and sides. Make sure the door openings will be exactly 23 1/2" tall when you lay out these biscuit slots, taking into account the fact that 3/4" thick plywood is almost always less than 3/4". Since the divider-to-cabinet-side biscuit joints aren't located along the ends of the cabinet sides but midway, you'll cut them in two separate machine setups (see photos, above). Your biscuit joiner manual should explain how to make these "face-to-edge" biscuit joints, or you can find more information on the Internet.

Next, drill rows of 5 mm-dia. shelf pin

holes in the side panels for the upper shelves as well as for the shelves behind the doors. Drill the hinge baseplate mounting holes, too (see right photo, below). I set my cabinets up so the right-hand cabinet doors pivot on the left side, and the left-hand cabinet doors pivot on the right side. Drill pocket screw holes in the end of the top panel that will be closest to the bed cabinet (these screws will serve as cabinet-to-cabinet attachments). Finish-sand the inside faces of the cabinet components, then assemble the parts with biscuits, glue and clamps.

Cut a plywood panel for each cabinet door, and wrap it with more 1/8" hardwood edging to hide the edge plys. Mount the hinges and hinge baseplates,

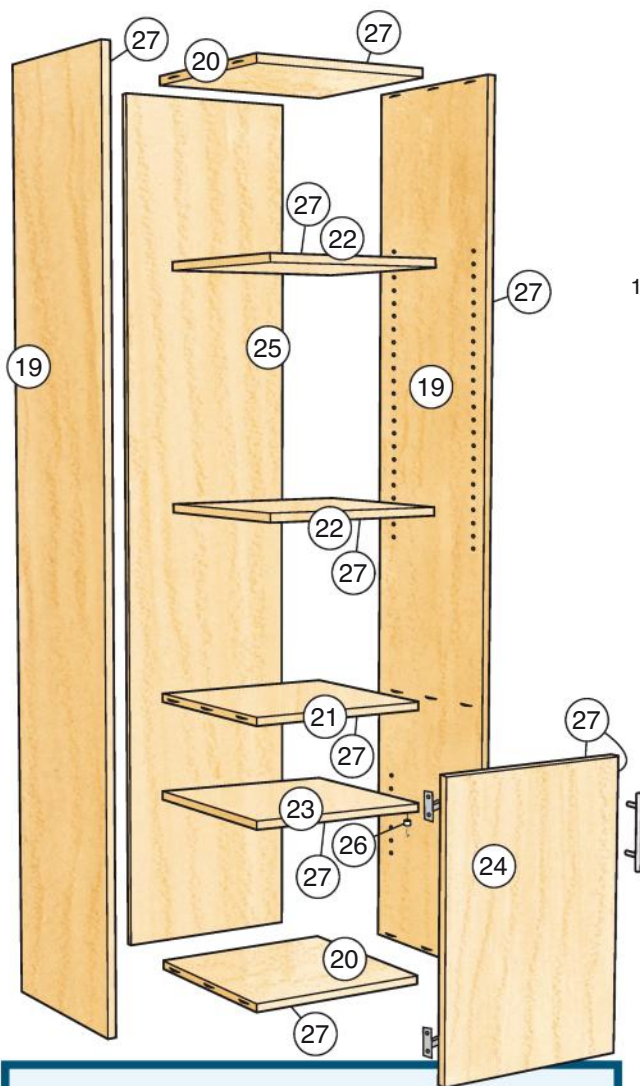


**Drill rows of shelf pin holes into the side panels of the side cabinets using the JIG IT Shelving Jig and included self-centering 5 mm drill bit.**



**The author used a JIG IT Hinge Plate Template for Inset Door Hinges and a #6 self-centering bit to drill screw holes for the hinge mounting plates.**





## MATERIAL LIST

### Side Cabinets (to build 2)

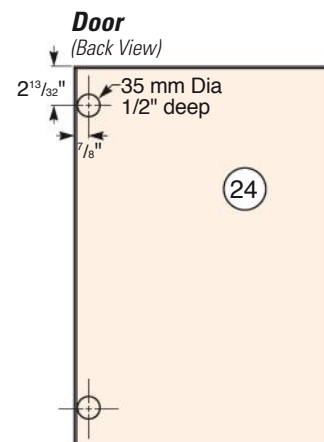
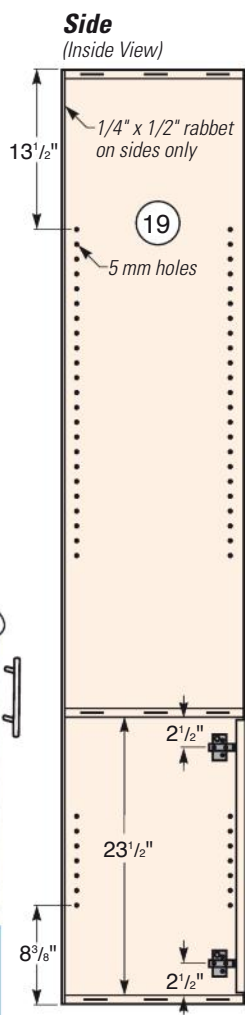
	T x W x L
<b>19</b> Sides (4)	3/4" x 15 5/8" x 79"
<b>20</b> Tops, Bottoms (4)	3/4" x 15 5/8" x 16"
<b>21</b> Dividers (2)	3/4" x 15 5/8" x 16"
<b>22</b> Shelves (4)	3/4" x 15 5/8" x 15 15/16"
<b>23</b> Shelves (2)	3/4" x 14 1/4" x 15 15/16"
<b>24</b> Doors (2)	3/4" x 15 5/8" x 23 1/2"
<b>25</b> Back Panels (2)	1/4" x 17" x 79"
<b>26</b> Door Stops (4)	9/16" diameter
<b>27</b> Edging	1/8" x 3/4" x 34 ln. ft.

then test-fit the doors in the cabinets. While they're hung, attach the door stops (pieces 26) now, too. When all is set, remove the stops, hinges and baseplates. Cut the back panels (pieces 25) to fit the carcass openings. Finish-sand the doors and ease their sharp edges.

### Applying the Two-part Finish

If you've never used milk paint before, you'll find it similar to latex wall paint

in how it looks wet and how it's applied, but the end result is a finer, more durable finish. White milk paint will be considerably thicker than darker colors,



like the gray I've used here. This is normal. I applied two coats of either white or gray to the exposed surfaces using a small paint roller to get it on super fast, and then smoothed the finish by lightly brushing it with a 4" synthetic paint brush. Sand between coats with 320-grit paper. Use a 1 1/2" synthetic "sash" paint brush to apply the paint to the inside corners of the side cabinets. Follow the same procedures to apply two coats of clear topcoat.

### Bed Assembly and Setup

When the finish thoroughly dries, move the big components to where they will be installed. Assemble the bed cabinet with pocket screws, and install the crown on top of it with countersunk screws. Now measure, cut and remove the baseboard from the wall area where the cabinets will be mounted. Here's a suggestion: remove baseboard for the bed cabinet first, mount the cabinet, and then scribe and cut away more baseboard to allow for the side cabinets.



Glue and clamp the side cabinet pieces together, making sure the assemblies remain square when you tighten the clamps.



**Using a drill press, bore the 35 mm x 1/2"-deep hinge cup holes into the back faces of the side cabinet doors. Test your setup on scrap wood first to ensure that the door-edge-to-hole-edge spacing is correct.**



**Apply two coats of milk paint using a 3" or 4" x 3/8" nap paint roller. "Tip off" the rolled-on coat paint with a 4"-wide quality synthetic bristle paint brush to smooth it further. And be prepared: there's a lot of surface area to paint!**

You're now ready to attach the bed cabinet to the wall. Install a few screws through the lower back panel, and attach the "L" bed-to-wall brackets included in the hardware kit. It is **absolutely critical** for safety that these bed-to-wall brackets are positioned over wall studs and screwed into them securely.

Following the hardware kit instructions, set the bed frame in place on the mounting plates and install the pistons. Reassemble the bed frame door. Attach the center pulls to it with four #8-32 x 2" machine bolts, and then attach the metal door brackets to the back of the door. Now hang the door on the bed frame.

Be absolutely certain it is centered side-to-side by measuring the space on each side between the bed frame and door edge. Check at the top and bottom, too, so you know it's square. You can correct any door-to-cabinet height issues by shimming under the upper door brackets, or by repositioning them. When all is set, insert the other screws that lock the door in place on the bed frame. You can correct minor misalignment of the door and cabinet by repositioning the bed-to-wall "L" brackets and shifting the cabinet in and out, and side-to-side.

Lastly, turn your attention to the side cabinets. If you haven't done so

already, fasten the back panels into their rabbets. Attach the cabinets to the bed cabinet and wall: drive 1 1/4"-long pocket screws through the side cabinet tops into the bed cabinet, and add screws inside the side cabinets behind the doors as needed. Fasten wood cleats at the top of the side cabinets to secure them to the wall with screws. Hang the cabinet doors, install the shelves, and you're done! Now, I bet you know just the spot for a well-deserved nap.

*Bruce Kieffer is a woodworking author, technical illustrator, and frequent contributor to Woodworker's Journal. His website is [kcfi.biz](http://kcfi.biz).*

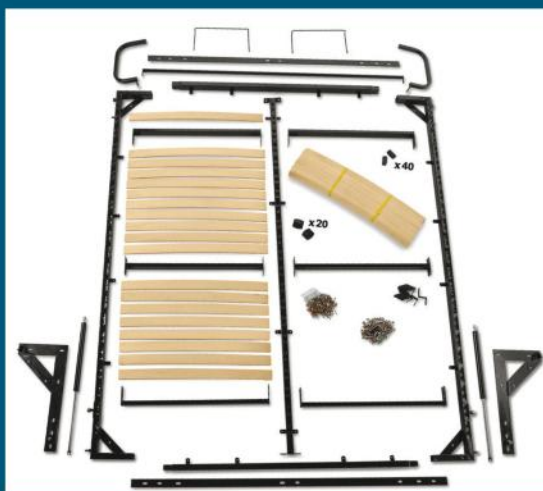
## Murphy Bed Hard-to-Find Hardware

### Bed Cabinet

Murphy Bed Queen-Size Hardware Kit (1) #54386 ..... \$374.99 ea.  
Amerock Stainless Steel Bar Pull 256mm (2) #26074 ..... \$11.99 ea.  
Medium Rockler Bandy Clamps (20) #54258 ..... \$19.99 pr.  
Bench Dog® Crown-Cut (1) #23238 ..... \$27.99 ea.  
Kreg R3 Pocket Hole System (1) #22708 ..... \$39.00 ea.  
GF Milk Paint, Driftwood (2 pints) #55098 ..... \$17.99 ea.  
GF Milk Paint, Snow White (4 pints) #35877 ..... \$17.99 ea.  
GF Flat Water-Based Polyurethane (1 quart) #59861 ..... \$27.99 ea.

### Side Cabinet (per cabinet built)

Blum® Soft-Close 110° Inset Hinges (1 pair) #34807 ..... \$18.99 pr.  
Nickel 5mm Shelf Pin Supports (12) #22898 ..... \$3.99 pk.  
Amerock Stainless Steel Bar Pull 192mm (1) #23331 ..... \$12.99 ea.  
JIG-IT® Hinge Plate Template for Inset Door Hinges (1) #56585 ... \$7.99 ea.  
Rockler #6 Self-Centering Bit (1) #68991 ..... \$12.99 ea.  
JIG-IT Shelving Jig w/Self-Centering Bit (1) #35151 ..... \$34.99 ea.  
FastCap Euro Door Stops for Inset Doors (1) #45201 ..... \$2.49 pk.  
GF Milk Paint, Snow White (2.5 pints) #35877 ..... \$17.99 ea.  
GF Flat Water-Based Polyurethane (.5 quart) #59861 ..... \$27.99 ea.



To purchase these and other products online, visit [www.woodworkersjournal.com/hardware](http://www.woodworkersjournal.com/hardware)  
Or, call 800-610-0883 (code WJ1577).



# Bathroom Vanity That Maximizes Storage

By Anatole Burkin

*Sporting quartersawn walnut-veneered plywood, this bathroom vanity also features three graduated drawers with split false fronts for pleasing proportions.*



**A**ny cabinet that shares space with plumbing is a compromise between utility and storage. When I needed to replace an aging bathroom vanity, I was determined to get the most out of the available space as well as build something with a little more pizzazz. After some research into the latest products on the market, I discovered that a lot had changed in vanity

design since I last looked. So I set out to build a modern furniture-style cabinet with lots of storage.

The key design features include a prominent horizontal grain pattern wrapping all three faces and



*The maple drawers are individually designed to wrap around the sink bowl and plumbing, which maximizes storage and ease of access.*



**Case parts are cut from plywood using a track saw. For precision rip cuts, the adjustable drywall square can be used as a parallel guide by using the adjustable leg as a stop to position the track saw rail a consistent distance from the edge of the stock.**



graduated drawers. To give the piece less of a built-in look, it is elevated off the floor on a set of adjustable chrome legs. Inside, drawers wrap around the sink bowl and plumbing supply and drain lines, providing easier access and making better use of the space.

Since this vanity was going into a master bath, I raised the height slightly, to 36 inches at the counter, a much more comfortable height for most adults.

This particular piece has quartersawn walnut plywood for the show parts of the cabinet, although the same effect can be had with a number of other woods in a rift or quartersawn pattern. And although it looks like there are six individual drawers, there are only three banks; the false fronts are split down the middle for more pleasing proportions and reveals.

## Build the Carcass First

In my view, there is no faster and stronger way to build furniture than with Festool Dominos. The tooling is a bit pricey, but I've gotten my money's worth out of this machine a few times over. That said, pocket-hole joinery or biscuits are great options, too.

The carcass requires most of one sheet of furniture-grade 3/4" plywood for the sides and false drawer fronts. The bottom is built with less costly 3/4" birch, and the back and drawer bottoms require 1/2"-thick birch plywood.

To work with plywood, I long ago gave up on a table saw. For one, my workspace is too small to keep a dedicated cabinet saw with the requisite large outfeed table. Two, it's always

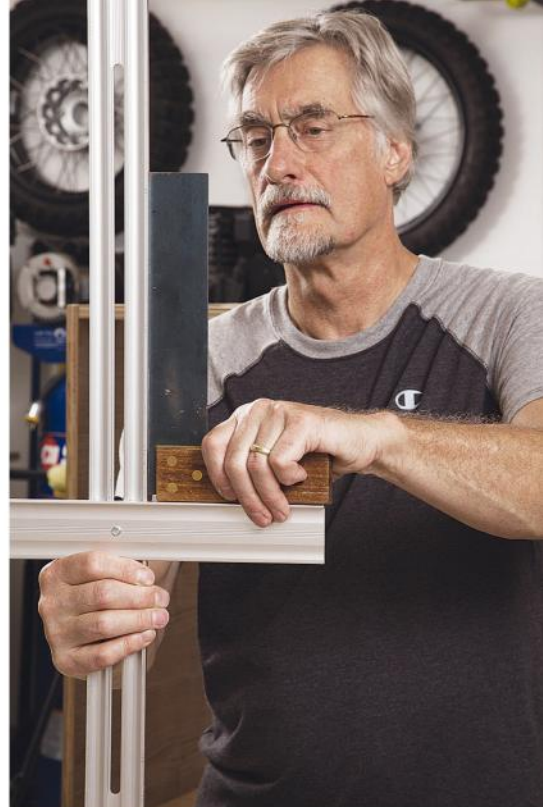
easier to bring the tool to a heavy piece of material than the other way around. My cutting tool of choice is a track saw. The best of these machines will give you perfect, tearout-free cuts in one pass.

## Trick to Accurate, Repeatable Cuts

There is no shortage of track saw accessories to help make all types of cuts with a high degree of accuracy. I'm not in that deep with gadgets (yet) and have found a number of workarounds. Unlike a table saw fence, a basic track saw and guide rail have no means to ensure accurate repeatable cuts when cutting multiple components. Setting up the guide rail for each cut using a tape measure leaves a margin for error. I have two cheap solutions: an adjustable drywall square and drill bit.

I use the drywall tool like a woodworker's combination square to set the guide rail in place for repeatable cuts of large components. First, use a tape measure and mark the width of the cut to be made. Then position the guide rail (saw blade side) right on that mark. Now set the adjustable leg of the drywall square for the distance between the stock edge and guide rail (for narrow pieces, a combination square is all you need). Fine-tune the position of the guide rail by using the square to check the position fore and aft. It usually takes a bit of fiddling.

**To ensure matching parts such as a pair of cabinet sides, stock can be stacked and cut at the same time.**



**Check the drywall tool with a more accurate square regularly to ensure precise alignment.**

Given their intended purpose, a drywall square isn't a precision instrument like a woodworker's combination square, so use your finer tools to check the big brother for square when setting up and occasionally during use.

While one can use a drywall square or a framing square to align a guide rail perpendicular to an edge, there is a chance that for a long cut, the rail may be positioned off just a hair, so that's why I use the above-mentioned method for cuts longer than 16" or so. Experiment and see what works for you. When cutting parts with 90° corners, I regularly check the diagonals to make sure error hasn't crept in.

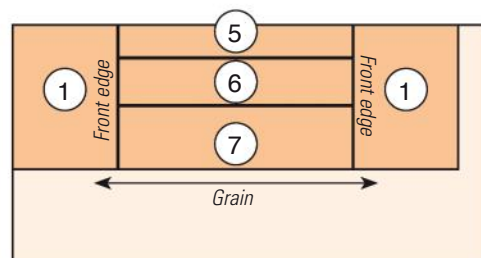
Now for the drill bit tip: To make a matching rip cut to an already cut







**Another way to make no-measure repeatable cuts is to use a drill bit the same diameter as the saw kerf thickness as a positioning guide. First, set an already cut component atop raw stock, setting an edge flush. Then place the drill bit between the component and the cutting edge of the guide rail. Check the guide rail's position fore and aft, then remove the component and make the cut.**



**Lay out the exterior case parts on the 4x8 sheet of plywood in this pattern to create a wraparound effect.**

component, take the finished piece, line it up with a good edge of the sheet good to be cut, then place a drill bit the size of the saw's kerf (3/32" is pretty close) between the guide rail's cutting edge and the finished workpiece.

Note: This technique is only as accurate as the saw guide rail's replaceable splinterguard. If it's beat up, replace it.

## Making the Cuts

For clean cuts, plywood needs a flat, stable support surface underneath. One easy solution is to place a piece of rigid foam on the ground as a cutting table. For a more comfortable and durable solution, I built a collapsible cutting grid out of two-by-fours. (I got the idea from builder Mike Sloggatt, who has a YouTube channel with other DIY tips.)

To get the wraparound grain effect for this cabinet, lay out the parts according to the *Diagram*, above. Basically, imagine unfolding and flattening the

front and sides of the cabinet and lay out accordingly. These are the most critical cuts, so take time to think it through and measure carefully. Cut off the factory edges of the plywood if they're chipped or marred in any way.

While an 8-ft long saw guide rail could be handy, I still haven't invested in one. Plywood cabinet components are typically no longer than three or four feet, usually less, so a long rail isn't needed.

I start by ripping off the section I won't be needing, then crosscutting the sides, leaving them a hair taller than what I'll need for their final dimension.

Next, I stack the two side pieces, and cut them at once to the desired height. Stacking ensures a perfect match. Remember to set and reset your saw for different depths of cut. I usually set the saw to cut about 1/8" deep into the cutting grid below the workpiece.

Rip the drawer fronts to their respective heights, allowing for the thickness

of edge banding. You want the top drawer a hair below the front edge of the cabinet. Leave the drawer fronts as three pieces for now; crosscut them to final size after the carcass is assembled in case of any slight deviations from the plan. In general, this is a good practice. Build and measure in stages. Accept a little adjustment here or there. Don't be a slave to a cutting list.

Cut two top rails for the carcass and the bottom, all at the exact same length. Here is where I used a case side to set up the guide rail (using a drill bit to mark the kerf) to ensure the bottom and rails were identical in length.

Next, cut rabbets in the sides, bottom and rear top rail to accept the back panel.

Then, cut the joinery for the carcass. I used Dominos, size 5 mm by 30 mm, for all the joints. Dry-fit the cabinet and prepare the pipe clamps (a helper comes in handy at this point, as this is a large cabinet, and it's a lot easier for two people to work together on assembly than to try to do it all by your lonesome). Then I measured for the back panel and cut it 1/16" undersize.



**A Domino joiner makes quick work of cutting slots for the carcass joinery. These joints result in a very strong case.**



**Rabbet the back edges of the carcass for the back panel. Use a straight bit and take multiple passes.**



**Iron on pre-glued edge banding to the front edges of carcass parts. Move steadily to avoid burning.**



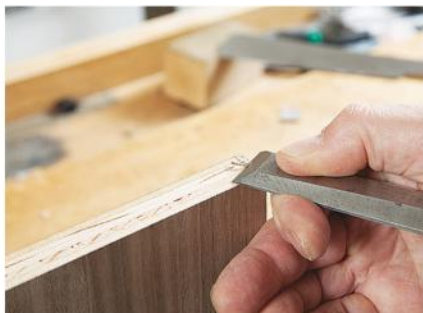
**Immediately apply pressure along the banding with a block of wood rubbed back and forth a few times to set the glue.**



**Once cooled, a specialty tool makes quick work of trimming the banding flush on the long edges.**



**For end cuts, a flush-cut saw is the way to go. Use light pressure to avoid splitting.**



**Finish up with a chisel if necessary.**

Next, attach the edge banding to the front edges of the cabinet. Be gentle when trimming the banding to avoid marring the good face of the plywood. Finish off with a very light sanding to ease the edges. The case sides also get

a light hand sanding, with the grain. Remember that plywood skins are thin.

At this juncture, there are two ways to go. The cabinet can be glued up, and finish can wait until all the components are ready. Or, the carcass parts can be finished before assembly, laid flat, to avoid runs and drips. I prefer the latter method. I only worry about the outside faces; a less-than-perfect finish on the inside won't matter, as drawers will eventually hide any slight flaws.

Once the show faces are finished, glue up the cabinet and enjoy the first big accomplishment. For legs, I used chrome corner legs with adjustable feet (see *Hardware* box, page 42). The front legs can be flush to both edges of the cabinet, but for the rear, be sure to set them inward enough to allow for a baseboard.



**To avoid the risk of runs and drips, apply finish before assembly, with components laid out horizontally.**



## Tips on Using the Domino Joiner

I've used the Domino to join everything from large cases to doors, drawers and furniture legs. The machine has a lot of great options to make work fast and accurate.

For example, retractable pins on the face allow for automatically starting mortises from the edge of a workpiece, then spacing mortises apart at even intervals. This often works fine, but sometimes those registration points fall in the wrong place. When I need to mark locations manually, I make up a marking tool (story stick) with centerlines for all mortises.

When using the marking tool, remember to always measure from a common edge. For example, when making drawers, register the stick to common edges (i.e., top OR bottom) of all parts and keep in mind the location of the dado for the bottom panel. Also, when cutting the mortises, be sure to always register the machine to common faces of the parts (outside is most common for case goods and drawers). Last, always make test cuts; not all joints can be cut to the same depth. For example, when building the drawers, I had to cut deeper mortises on the fronts and backs, and shallower mortises on the sides, so that I wouldn't cut through the 5/8"-thick material.

It's a good idea to have a little wiggle room for assembly, especially when there are long rows of mortises. If just one is off, that can wreak havoc during glue-up. To solve that, cut mortises for one set of mating parts at a slightly wider setting. That allows parts to be shifted a bit for perfect alignment, much like with biscuit joints. For cabinet cases and drawers, this method will not compromise the strength of the joint. I would not recommend it for table or chair legs, where the joints should be spot-on due to racking forces during the lifetime of the piece.

In preparation for glue-up, I prefer to first glue the Dominos into one set of parts and let the glue set. That way, I can check for squeeze-out and go through a stress-free dry-fit. It's not uncommon for something on a large case to be off just a hair; pounding on the joint or reefing on a clamp can break parts. Use a chisel or file to fine-tune any Dominos that don't easily find home or are proud. But don't overdo it. Parts should fit snugly.





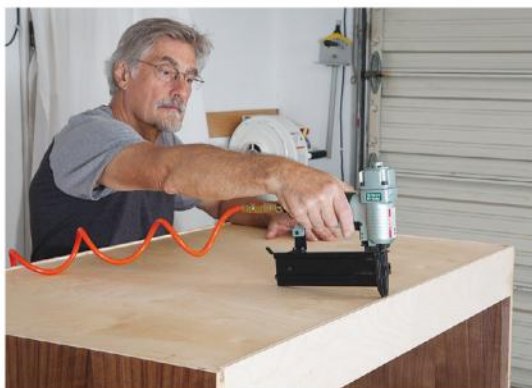
*To take the stress out of assembly, first glue Dominos into one half of the carcass parts and let them dry.*



*Good-sized bar clamps are needed for a case of these dimensions, but don't over-tighten them.*



*Use shop-made wooden corner blocks with tape applied to protect the fragile corners of the plywood carcass from the clamp jaws. Once clamped, check for square. Corrections can be made by pulling the long diagonal with a clamp.*



*The back panel is glued and nailed into place. Go gently on the glue to avoid squeeze-out.*

## Measure For; Build the Drawers

From the outside, there is no hint of how differently all three drawers are built. The top bank is a set of two individual boxes joined by an additional full-width false front; the center bank is U-shaped; and the bottom one is a tradi-

tional rectangular box but with a cutout at the rear to clear the P-trap.

Before going down this route, it's best if the plumbing is centered (or close-to) with the cabinet centerline and compactly positioned (water supply lines close to the drain line). That way, the design can be symmetrical and drawers can be of a generous size. But it's not a dealbreak-

er if things don't line up perfectly; the drawers can be sized asymmetrically. It may not be worth the cost to reroute plumbing only a few inches.

Before starting, it's best to have on hand all the other parts: counter, sink, drain and supply lines. I chose a one-piece counter with integrated sink, but the options are endless. To consistently mark all the parts and have all the dimensions of plumbing components



*Drawer sides and backs are also joined with Dominos. Here, a story stick is used to lay out the joints. Avoid cutting a mortise too close to the dado for the drawer bottom.*

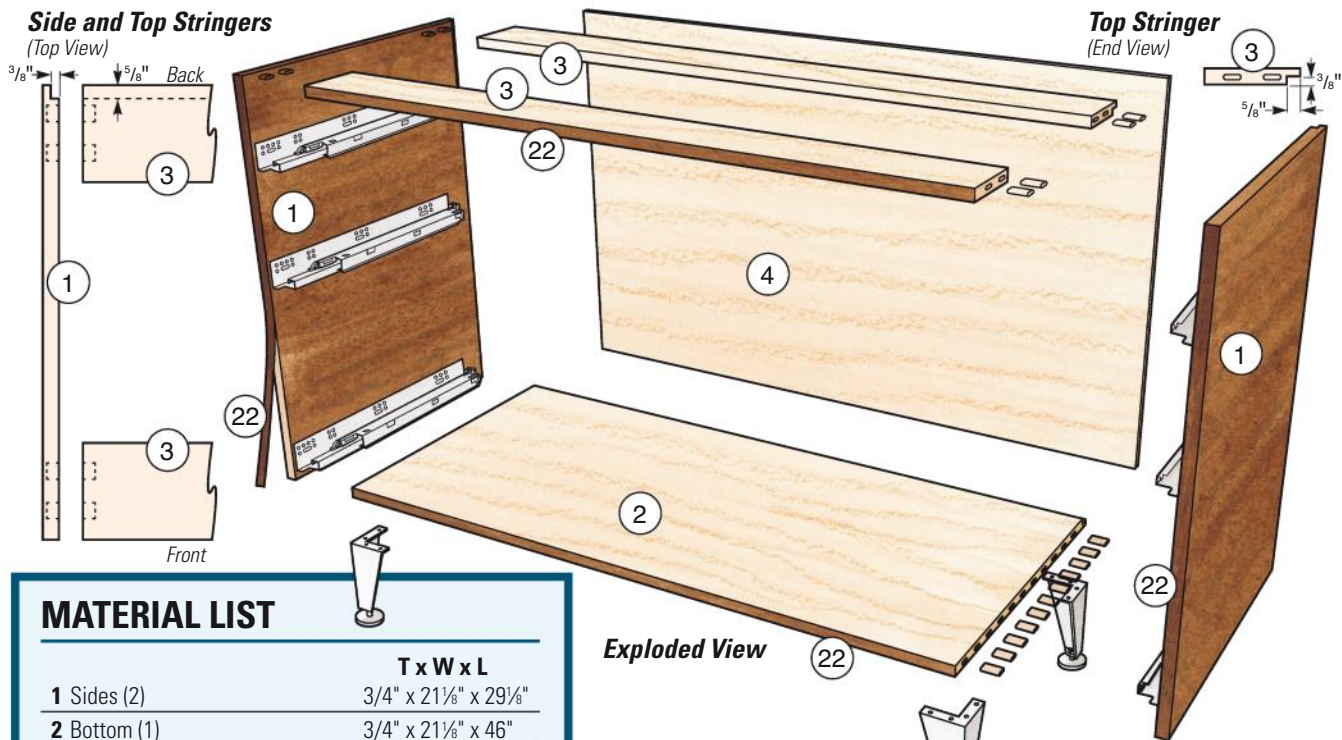


*Note that mortises on one half of the drawer components are cut slightly wider (inset photo). That's to allow parts to be shifted, as needed, to perfectly align drawer bottom dados during glue-up.*



*A half-inch straight bit in a router table cuts the dados for the drawer bottom.*

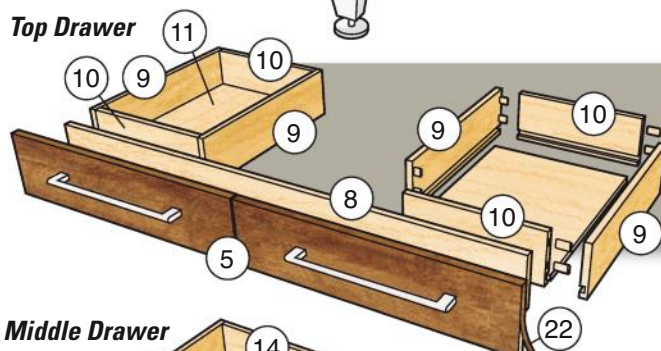




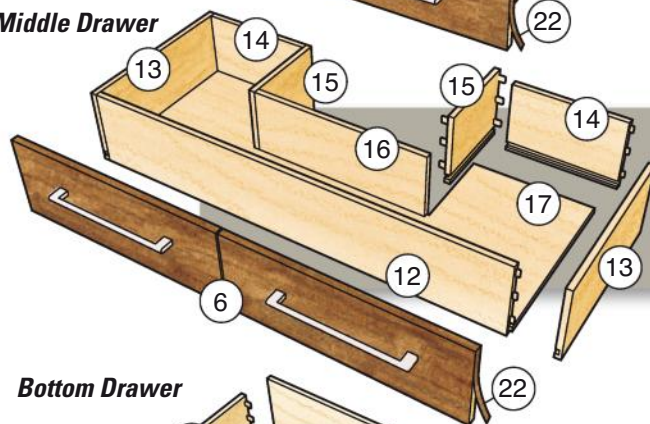
## MATERIAL LIST

	T x W x L
1 Sides (2)	3/4" x 21 1/8" x 29 1/8"
2 Bottom (1)	3/4" x 21 1/8" x 46"
3 Top Stringers (2)	3/4" x 4 1/2" x 46"
4 Back (1)	1/2" x 28 3/8" x 46 3/4"
5 Top Drawer Face (1)	3/4" x 6 1/2" x 47 1/4"
6 Middle Drawer Face (1)	3/4" x 9 5/8" x 47 1/4"
7 Bottom Drawer Face (1)	3/4" x 12 3/4" x 47 1/4"
8 Top Drawer False Front (1)	5/8" x 4 3/4" x 45 1/2"
9 Top Drawer Sides (4)	5/8" x 4 3/4" x 17 5/8"
10 Top Drawer Fronts/Backs (4)	5/8" x 4 3/4" x 11 7/8"
11 Top Drawer Bottoms (2)	1/2" x 16 1/2" x 12 1/2"
12 Middle Drawer Front (1)	5/8" x 8" x 44 1/2"
13 Middle Drawer Sides (2)	5/8" x 8" x 17 5/8"
14 Middle Drawer Backs (2)	5/8" x 8" x 12"
15 Middle Drawer Returns (2)	5/8" x 8" x 12"
16 Middle Drawer Center (1)	5/8" x 8" x 18 5/8"
17 Middle Drawer Bottom (1)	1/2" x 17 1/4" x 44 3/4"
18 Bottom Drawer Front (1)	5/8" x 11" x 45 1/2"
19 Bottom Drawer Sides (2)	5/8" x 11" x 17 5/8"
20 Bottom Drawer Back (1)	5/8" x 11" x 44 1/4"
21 Bottom Drawer Bottom (1)	1/2" x 17 1/4" x 44 3/4"
22 Peel and Stick Edge Banding (1)	15/16" x 50' roll

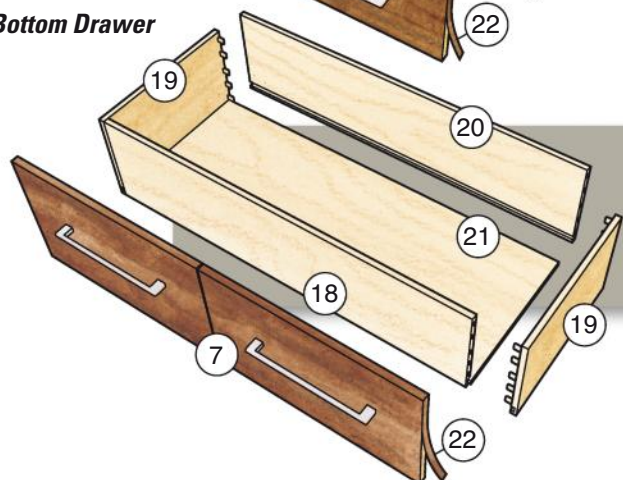
## Top Drawer



## Middle Drawer



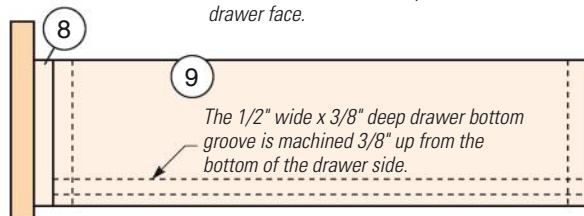
## Bottom Drawer



## Drawer Assembly

(Side View)

To connect the two separate top drawer sections, the author added the top drawer false front. It is mounted between the top drawers and their drawer face.







**To assemble the U-shaped drawer, start with the rear center section components, then slip the bottom into place.**



**Next, engage the drawer front with the bottom. Work quickly so that the glue doesn't set up.**



**The sides are assembled last. Use bar clamps to tighten the joints.**

at hand, I made up a story stick. Don't forget to account for a change in floor height if the final floor is not yet in place. Design the drawers accordingly. I leave a good inch or more clearance on each side around the sink bowl and plumbing.

I used soft maple for the drawers, planed down to 5/8" thickness (maximum for my slides). Because of the large size of the bottom two drawers, I wouldn't recommend 1/2"-thick pre-made plywood drawer components as they aren't as stiff as solid wood. Drawer bottoms are all 1/2"-thick plywood.

I used Dominos for joining the sides to the backs, and dadoes to connect the bottoms. You could also use dovetails or another method of joinery you choose.

The center drawer takes a little more effort to build accurately. The trick is to first build and dry-fit the box without the bottom. Then check for square and measure for the U-shaped bottom, and cut it shy about 1/16" all around to leave a little wiggle room. During glue-up, as-

semble the center section first, then position the front face and attach the ends.

Regarding milling marks and other flaws: To save effort, I don't spend a lot of time sanding parts that won't show, such as the back sides of drawers or the outside face of the false fronts, which in this case had terrible tearout from the planer. I put all my effort into the parts that can be seen, such as the drawer insides and, of course, the outside of the case.

Remember, the plywood drawer fronts will cover up any imperfections on those parts of the drawers.

Once the drawers are glued up, I set the slides — in this case Blum Tandem with Blumotion. The slides have a nice self-close feature as well as some adjustability after installation. The most import aspects of installation, besides not accidentally drilling through the

case sides, are making sure that pairs of slides are at the same height, perpendicular to the case edge and with the proper setback. I use a story stick instead of a tape measure for reliability. But don't stress too much; misplaced slides can be easily repositioned. A few extra screw holes inside the cabinet will not be seen by anyone except the plumber. Plus, the Blum slides have micro adjusters to allow for a little tweaking after all parts are assembled.



**When installing drawer slides, a piece of scrap clamped to the drawer sides, perpendicular to the edge, helps keep the hardware positioned accurately so it can be screwed in place.**

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Contemporary Metal Furniture Legs, 6 1/4" (4) #35955 .....	\$15.99 ea.
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**If necessary, add a notch in the bottom drawer's back to clear the sink's P-trap. When making bathroom cabinetry, planning for the plumbing is an important consideration.**



**The false drawer fronts are first tacked to the drawers using double-sided tape. Stacked coins can be used for spacers. Finish up by screwing the false fronts in place from the inside, then attach pulls of your choosing.**

## Finishing the Piece

I used two products to finish the piece: General Exterior 450 semigloss water-based finish, and General Seal-a-Cell Clear wipe-on sealer.

First, sand all the parts to 180-grit, then vacuum the dust and wipe down using a rag lightly dampened with alcohol. In between coats of the sealer and topcoat, sand with 240-grit or 320-grit.

The sealer is not water-based and it reduces the amount of grain-raising as well as warms up the tone of the walnut. I used two coats of it on the show faces. This product is easy to wipe on with a rag. Give it 48 hours to fully dry before going to the top coat.

For the top coat, the General 450 finish can be sprayed or brushed (use a foam brush). I tried both methods and was impressed with how easy the product laid down. Use two coats minimum for a good water-resistant finish.

One tip regarding finishing, whether by spray or brush, to eliminate runs: Apply the finish to all show faces of parts as they are laid out flat, before you assemble the project. Be sure to wipe off any drips along the edges. If you're finishing your surfaces with joinery, make sure to tape off those regions before you apply the finish.

## Installing False Fronts

There are any number of ways to install false fronts. For example, a product called drawer front adjusters allows for some wiggle room once attached. You can also use 1/2" double-sided weather-resistant tape, which has amazing holding

capacity, and washer head screws.

If you choose this route, start by marking the locations for screws to hold the false fronts in place, keeping in mind the eventual location of drawer pulls. Drill four oversized holes per false front.

I prefer to install one false front at a time. Place two small pieces of double-sided tape on the drawer front and set the false front in place, eyeballing the first one, then using some sort of spacers for the subsequent ones. Attach it with two washer head screws. Continue until all drawer fronts are in place. Then I remove them, peel off the tape (it holds so well that it's tough to make fine adjustments) and reattach. At this time, I make the final adjustments for even reveals and gaps. Sometimes I need to enlarge a few holes even more. Once I'm satisfied, I add the other two

screws to each drawer. It goes without saying: use screws 1/4" shorter than the total thickness of the false fronts and drawers, and remember that the top drawer will need longer screws where the box and additional false front meet up. Don't mix up those different length screws!

Install the pulls of your choice once everything is lined up. Then pull out the drawers, take the piece into the bathroom and mark and cut the plumbing holes. Last, attach the back to the wall at stud locations using at least four long screws.

You've now got a fine-looking vanity — try not to be too vain about it.

*Anatole Burkin, former editor and publisher of Fine Woodworking, is a freelance journalist and woodworker in northern California.*

**To mark locations for the cutouts, place the vanity against the stub-outs and use a short pencil to trace the locations. Drill for plumbing using a hole saw. Start at one side, then finish from the other to avoid tearout. Make the holes about 1/2" wider in diameter to allow a little wiggle room.**





# Shoe Storage Bench

By Sandor Nagyszalanczy

*This classy bench provides organized storage for many pairs of shoes, as well as a convenient place to sit while donning them.*



I'm not a particularly paranoid person, but sometimes, I think my shoes must be conspiring against me — I can never seem to find the pair I'm looking for when I'm ready to don them. This wastes a lot of time that could be better spent in the shop or strumming on my uke. Of course, this could have something to do with the fact that my shoes are usually scattered all over the floor of my closet ...

When I finally got around to cleaning up my act, I thought I'd kill two irritating birds with one stone and build a bench that not only provides organized

storage for all my shoes, but also affords a handy place to sit down while putting them on and taking them off.

The shoe bench I came up with has enough storage space for a dozen pairs of men's shoes (up to about size 13) or up to 18 pairs of women's shoes. The shoes sit on open shelves that are adjustable for height, to accommodate different kinds of shoes: dress shoes, sneakers, low-top boots, etc. I added a tall central cubby between the banks of shelves just for my favorite pair of cowboy boots, and a small drawer for shoe cleaning supplies.

Instead of making the bench using a combination of hardwood veneered plywood and solid lumber, I decided to build it almost entirely from solid red oak. I came to this decision not only because red oak happened to be on sale at my local lumberyard, but also because I really hate having to glue edge strips onto plywood parts to cover up their inner plys.

However, using solid wood did require some special construction details, to accommodate its natural tendency to expand and contract in response to changes in humidity. I'll share those tips in this article.





**Orient the grain of plainsawn boards so the curve of the growth rings (viewed on the end grain) curves up (like a smile) relative to the top surface.**

## Cut Out and Glue Up

After purchasing enough stock for the project, the first task is to glue up all the wide parts necessary for the bench: the seat, bottom, bulkheads, side panels, drawer support and shelves (see the *Material List* on page 47). For parts that are the same width, such as the side panels, it's easier to glue up a panel that's a little more than twice as long, then cut the individual panels to length later. The tip shown in the photo above will help keep a panel flat if it wants to cup. Apply a nice, even coating of glue to all mating edges (I like to use a glue roller to spread the glue out). After clamping, check with a rule to make sure that each panel is nice and flat, and that the mating edges align evenly.

After the glue on each assembly dries to rubbery hardness, scrape off the squeeze-out and any drips that may have formed. Run each panel through a planer to bring it down to its final thickness. If you don't have access to a planer with a cutterhead wide enough to handle the panels, glue them up from pre-planed stock; just make sure that each panel remains flat after it's clamped up. Trim each panel to final width and length, taking care to keep all edges straight and square.

## Legs, Rails and Side Panels

The sides of the bench are built with frame-and-panel construction. A pair of 1½" square legs are spanned by a pair of short rails at each end of the bench; long rails connect the end assemblies. These legs are mirror images of each other, left and right front legs and back legs. All rails connect to the legs with loose tenon joints (I used the Festool



**After applying glue, spread evenly with a rubber roller to the mating edges of both boards, the author clamps up one of the shoe bench's panels and checks it for flatness with a rule.**

Domino system for this, but you could substitute mortise-and-tenon or dowel joinery if you wish). Start by cutting the legs and rails to size as per the *Material List*. To help you keep the orientation of the legs straight during numerous machining operations, mark the top of each one, as shown in the photo at right.

Chop the mortises for the long rails first, each sized for a 10 mm x 50 mm loose tenon and positioned as shown on the *Drawings* on page 47. Next, on the adjacent face of each leg, chop the mortises for the short rails, positioned as shown in the *Drawings* on page 47. Mortises, centered in both directions, are then chopped into both ends of all four long rails, as well as the lower short rails. Mortises on the upper short rails are offset widthwise as shown, so they won't intersect the long rail mortises.

Now, using a router table, plow the grooves that hold the bench's side panels into the legs and short rails. Fit a 1/4" straight bit (preferably a spiral fluted bit) in the router and set the table's fence so that there's 3/8" between the fence face and the centerline of the bit. Set the bit's cutting depth to 5/16" and rout a groove into the top edge of each lower short rail, as well as the bottom edge of each upper short rail.

Next, rout a groove into the legs that will hold the raised side panel. Set the bit's cutting depth to 5/16" and the

table's fence face so that there's 3/4" to the centerline of the bit. Rout a stopped groove into the same face of each leg as the short rail mortises are on. The groove should only span the distance between the two leg mortises. Using the same 1/4" bit set to the same cutting depth, rout a groove into the rear legs to house the bench's plywood back panel. Space the grooves 1/8" from the back face of each rear leg.



**Marking the end of all four legs helps you keep track of the orientation of each leg during all the subsequent machining operations.**



**Two faces of each leg are mortised for the Domino loose tenons that will join the legs to the short side rails and long front and back rails.**





**Rout grooves in the edges of the side rails with a spiral straight bit chucked in the router table. These grooves will hold raised panels.**



**The author uses a vertical style panel-raising bit to raise one of the side panels, making the cut by taking a series of shallow passes.**



**The 3/8" groove in the lower rear rail for joining the bench's bottom is routed after loose tenons have been glued into both ends of the rail.**

You raise the side panels' edges on either a shaper or router table, using just about any style of panel-raising cutter/bit you wish. Just make sure to raise the panels in a series of passes: never all at once! During each pass, shape the short grain at the ends of each panel first, then shape its long grain edges. This helps prevent grain tearout and splintering. When you get close to the final pass (which should produce panel edges just a shade thinner than 1/4"), set up your

shaper/router table to take a very light cut. This should minimize tearout and burn marks and produce a profile requiring very little sanding.

A few more routing tasks remain: First, rout a groove into the inside face of the lower rear long rail (this will mate with the bench's bottom). Before routing, glue the two loose tenons into the ends of the rail and let the glue dry. Chuck a 3/8"-dia. straight bit into the router table set for a 3/8"-deep cut and spaced so the groove will be 3/8" from the rail's top edge. The groove should stop at the ends of the rail itself (see bottom photo at left).

You can use the same bit to make the back stop strip: rout a 3/8"-wide, 1/4"-deep rabbet into the edge of a piece of 3/4" stock, then slice off a 7/16"-thick strip.

To make the top buttons (used to fasten the bench's seat), take a 1 1/4"-wide strip of short-grain stock and rout a 3/8"-deep, 1/2"-wide rabbet on one edge, then slice off eight 1 1/4"-long buttons.

## Bottom, Drawer Support and Bulkheads

Once the bench's bottom, drawer support and bulkheads have been glued up and trimmed to final size, there's some machining to be done before the bench is ready for assembly.

Start by setting up a router with a piloted rabbet bit and pilot bearing set to take a 3/8"-wide cut. With the bit's cutting depth set to 3/8", rout a rabbet into the top back edge of the bench's bottom. The resulting short lip will fit into the 3/8" groove in the bench's rear lower rail, to allow the solid wood bottom to expand and contract.

Loose tenons are used to join the bench's twin bulkheads to both the

drawer support and to the bottom. Chop three mortises (centered thickness-wise and spaced as shown) into the bottom ends of the two bulkheads and both ends of the drawer support; the back edges of these three parts should be flush. Next, chop the shallow mortises into the inside faces of the bulkheads and top surface of the bench bottom; the front edges of the bulks should overhang the front edge of the bottom by 1/2". If you're chopping these with a Domino, clamp a straight board to each part to act as a fence, and plunge cut these mortises only 15 mm deep.

Now, using a table saw and a miter gauge fitted with a large fence, cut a pair of notches (sized as shown) into the front and back top edges of both bulkheads. These notches are for the upper long rails. Use a dowel jig and a portable drill to bore a single 3/8" hole into the center of each notch, for the dowels that join the rails to the bulkheads.

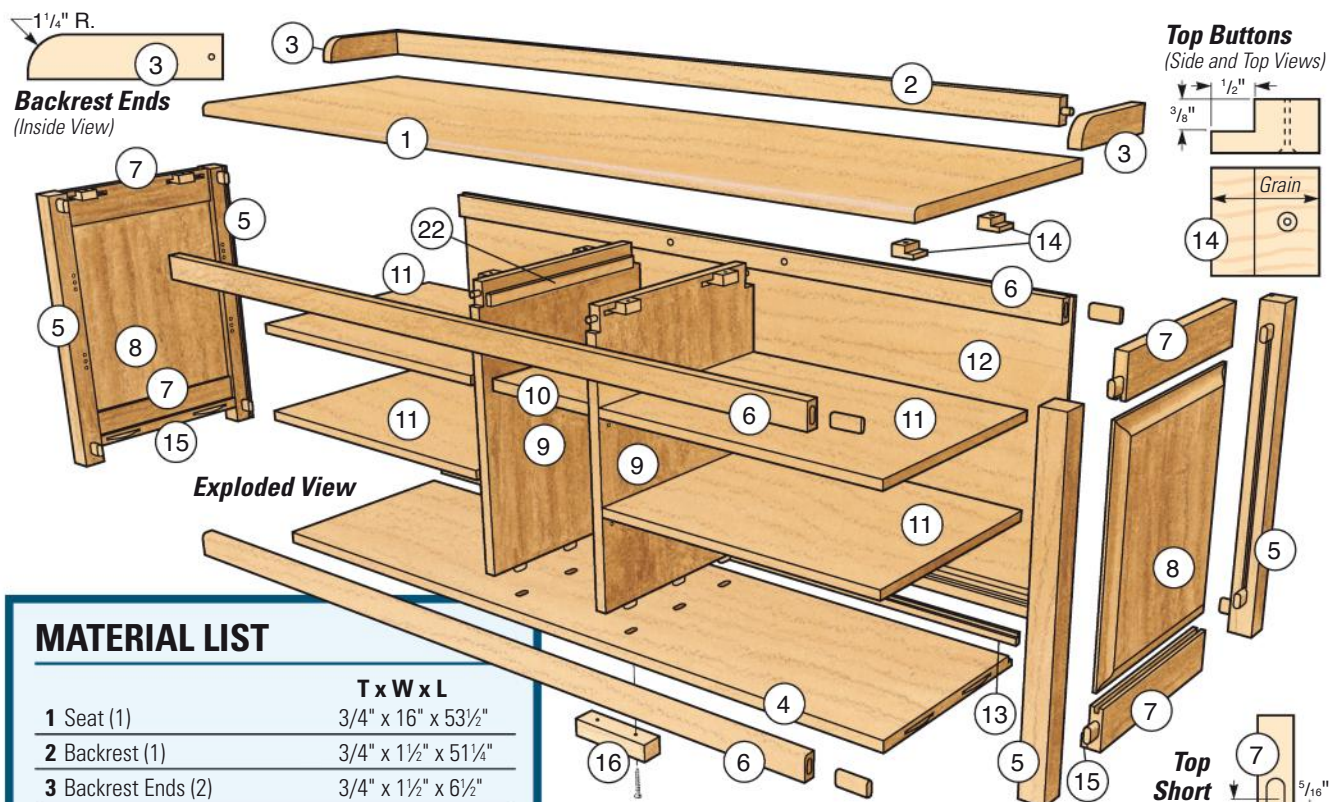
To rout the grooves for the top buttons that secure the bench's seat



**Shallow mortises plunge cut into the faces of the bulkheads are for loose tenons that will join them to the drawer support.**

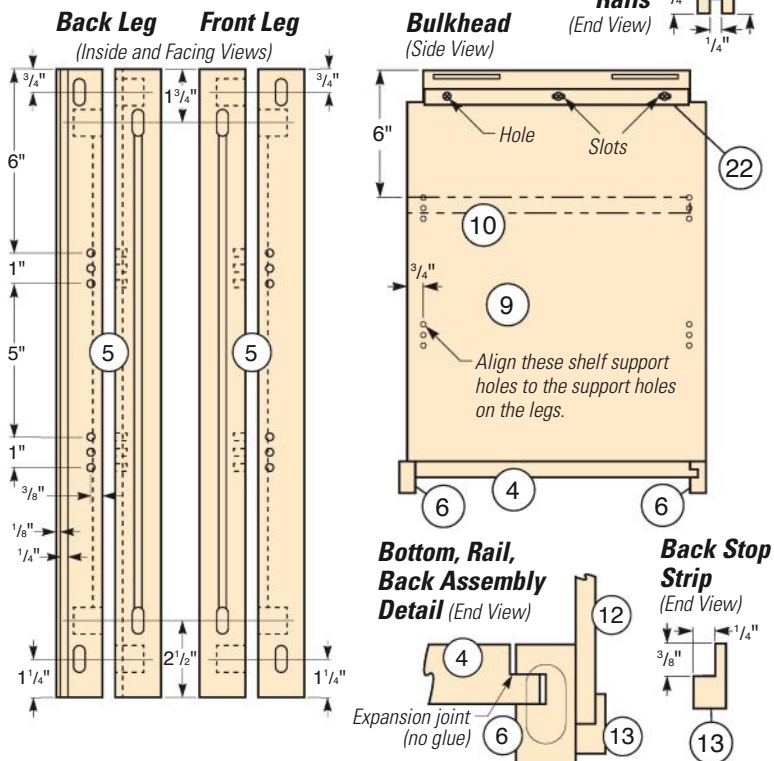
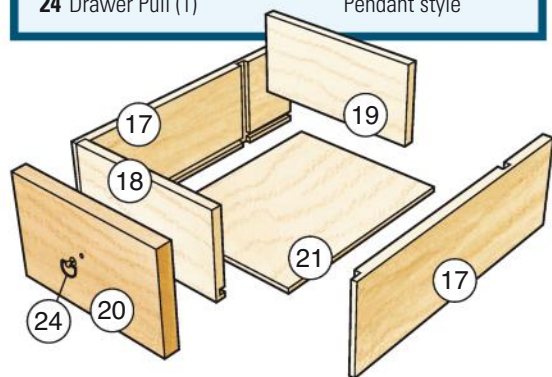
to the base (while allowing for wood movement), fit a router with a 1/4" kerf-cutting bit set with its cutting edge 3/8" below the router's sub-base. Rout a pair of 3"-long grooves at the top edges of the two bulkheads as shown. Also rout a pair of grooves at the top edge of the inside-facing faces of the two upper short rails.

Next, drill the holes for the shelf pins that support the bench's adjustable shelves. Chuck a 1/4" bit (preferably a brad point or Forstner bit) into the drill

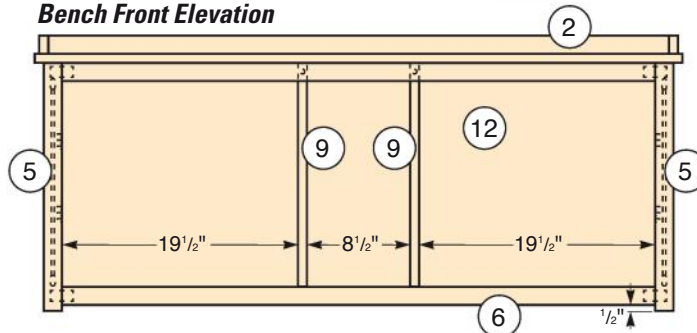


## MATERIAL LIST

	T x W x L
1 Seat (1)	3/4" x 16" x 53 1/2"
2 Backrest (1)	3/4" x 1 1/2" x 51 1/4"
3 Backrest Ends (2)	3/4" x 1 1/2" x 6 1/2"
4 Bottom (1)	3/4" x 14" x 49"
5 Legs (4)	1 1/2" x 1 1/2" x 20 1/2"
6 Long Rails (4)	3/4" x 1 1/2" x 49"
7 Short Rails (4)	3/4" x 2 1/2" x 12 1/4"
8 Side Panels (2)	5/8" x 12 3/4" x 14 3/4"
9 Bulkheads (2)	3/4" x 14 5/8" x 18 1/2"
10 Drawer Support (1)	3/4" x 8 1/2" x 13 3/8"
11 Shelves (4)	5/8" x 14 1/4" x 19 1/16"
12 Back (1)	1/4" x 19 1/2" x 49 1/2"
13 Back Stop Strip (1)	7/16" x 3/4" x 49"
14 Top Buttons (8)	5/8" x 1 1/4" x 1 1/4"
15 Spacer Strips (2)	3/8" x 3/4" x 12 1/4"
16 Center Foot (1)	1 1/16" x 1 1/2" x 6"
17 Drawer Sides (2)	1/2" x 4 3/8" x 13 1/4"
18 Drawer Front (1)	1/2" x 4 3/8" x 7 7/8"
19 Drawer Back (1)	1/2" x 3 7/8" x 7 7/8"
20 Drawer Face (1)	3/4" x 5 1/8" x 8 3/8"
21 Drawer Bottom (1)	1/4" x 7 7/8" x 10"
22 Drawer Guide Strips (2)	3/8" x 3/4" x 12 1/2"
23 Shelf Pins (16)	1/4" diameter
24 Drawer Pull (1)	Pendant style



## Bench Front Elevation







**A series of 1/4" holes drilled into the legs and bulkheads are for shelf pins that allow adjustment of the bench's shelves.**

press and bore a series of 3/8"-deep holes into the outward-facing faces of the two bulkheads, located as shown in the *Drawing* on page 47. Using the same setup, bore matching holes into the inside-facing edge of each leg.

## Drawer Construction

My original plan was to build the drawer of solid wood with dovetail corners, but frankly, I ran out of steam, so instead I used 1/2" Baltic birch plywood joined with simple rabbet-and-dado joints. After cutting the parts out and sanding them smooth, I cut the 1/4"-deep joints using a 1/2" dado blade stack in the table saw. I purposely located the back of the drawer box a full 3" from the back ends of the sides, so that the drawer is supported when pulled out far enough to access the contents. The drawer's 1/4" plywood bottom slips into a 1/4" x 1/4" groove cut 1/4" up from the bottom edge of the front and side pieces; it butts up flush to the bottom edge of the back. After gluing the drawer up and checking it for squareness, I reinforced each joint with a small nail, driven by a pneumatic pin gun. The 3/4"-thick oak drawer face is attached later.



**After gluing the drawer shelf to the two bulkheads (inset photo), glue and clamp this bulkhead/shelf subassembly to the bench's bottom.**

## Assembly

To make gluing up and clamping the bench's base more manageable, the assembly is done in several stages. Start by gluing the spacer strips onto the inside-facing face of each lower short rail, with their ends and bottom edges flush. Also glue the front lower long rail to the front edge of the bottom, keeping the ends and top edges flush. I rounded over the top edge of this rail with a 1/4"-radius roundover bit; I used the same bit to round over the top front edges of all the shelves. Next, using a plate biscuit joiner, plunge cut a pair of #20 size slots into both ends of the bottom, and matching slots into the two spacer strips (these help keep the bottom flat, while allowing wood movement).

The ends of the bench are assembled first: Glue both the upper and lower short rails to one of the legs, joining them with 10 mm x 50 mm loose tenons. Take care to keep each part oriented correctly. After slipping the raised panel into its grooves (raised portion facing outwards — and no glue, the panels must float), apply glue and install the other leg. After applying clamps, use a straightedge to make sure that the faces of the legs (with the mortises for the long rails) are flat and parallel to each other.

To assemble the bulkheads and drawer support, glue 10 mm x 40 mm loose tenons (you can cut standard 10 mm

x 80 mm Dominos in half), first into the mortises in the bulkheads, then the drawer support. After clamping, the distance between bulkheads measured at the top and bottom should be the same. Glue the bulkhead assembly to the bench bottom next, once again using 10 mm x 40 mm loose tenons and applying clamps at the front and back edges of the bulkheads. After the glue has dried, screw on the two drawer guide strips onto the inside upper faces of the bulkheads. To do that, slide the drawer in place and lay a strip of cardboard on top of it, to act as a spacer. Now set the guide strip on top and screw it in place (photo, next page). The holes at the back of the strip should be slightly slotted, to allow for wood movement.

To assure that final assembly goes well, I do a dry fit with no glue. Before attaching the upper long rails, I press 3/8" dowel center points into the four holes in the bulkhead notches. Once the rails are in place, I tap them against the points, then use the small indentations to drill 3/8" holes 1/2" deep into each rail. After unclamping all the dry-assembled parts, I glue the long rails into the bulkhead notches.

To begin final assembly, slip the lower rear long rail onto the lip of the bench bottom (no glue!), then apply glue to all the mortises in the ends of the long rails and legs. I also press (no glue!) #20 biscuits into the slots in the ends of the bottom. Glue the loose tenons into the

**Simple rabbet-and-dado joints join the shoe bench's small drawer sides, front and back members together.**



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For a video walking you through the steps to assemble this shoe storage bench, please visit [woodworkersjournal.com](http://woodworkersjournal.com) and click on "More on the Web" under the Magazine tab.

long rails first, then press the end assemblies onto the tenons. Use four long bar clamps to apply pressure at each corner of the base, gradually tightening until all joints are fully seated.

While the base assembly dries, work on the bench seat. First, round over the front top edge of the seat using a 3/8"-radius roundover bit. Saw a 1/4" radius curve onto one end of both short backrest parts, then join them to the ends of the long backrest piece with 3/8" dowels. Once dry, round over the front-facing top edges of the backrest. After sanding these parts to final



**A pair of drawer guide strips are screwed to the inside faces of the bulkheads through slotted holes that allow for wood movement.**

smoothness, mount the backrest atop the seat, centering it widthwise, and securing it with countersunk #8 x 1 1/2" screws from below.

## Finishing Touches

Once you scrape off any glue residue left after assembly, it's time to do final sanding and apply finish to the shoe bench's base, as well as the seat, back, shelves, drawer front and other small parts. I opted for several coats of a tinted Danish oil finish, in order to darken the light oak and give it a richer appearance.

When it dried, I set the seat upside down on my benchtop (covered with a



**After both top rails are joined to the bulkheads with dowels (insert), glue the side subassemblies to the other base components.**

towel to prevent damage), then set the base upside-down on top of it. After positioning the rear upper long rail flush to the back edge of the seat and centering the base side to side, fasten the seat by pressing the eight top buttons into their slots and screwing them down with #8 x 1 1/4" washer head screws. Now slide the 1/4" back panel into its groove in the legs, and secure it to the lower rail by nailing on the back stop strip. Nail the top of the back to the upper rail, then screw the center foot to the center on the underside of the bottom.

With the bench right-side-up on a low work table, I pressed the L-shaped metal shelf support pins into the appropriate holes and set the four shelves in place. To keep them from moving during use, I drove a #6 x 1/2" pan head screw up through the holes in the two front support pins of each shelf. Slide the drawer in place, and mount the drawer face by screwing it on from inside the drawer box, locating the face's lower edge flush with the bottom of the drawer support. Screw on a small, pendant style drawer pull.

When the job's done, it's easy to sit down, take off my work shoes and pull on a pair of comfortable slippers.

*Sandor Nagyszalanczy is a furniture designer/craftsman, writer/photographer and contributing editor to Woodworker's Journal. His books are available at amazon.com.*



**The author applies several coats of Danish oil finish to the shoe bench prior to attaching the back and mounting the seat.**



**Small wood buttons set into slots in the bulkheads and side rails secure the bench seat to the base, while allowing it to expand and contract.**



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comp at \$952.99

82497014

LIMIT 5 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 6/2/17. Limit one coupon per customer per day.

**CENTRAL MACHINERY** **SUPER COUPON**

**350 LB. CAPACITY FOLDABLE SAW HORSE**  
ITEM 69446 shown 61979/60710

**SAVE 44%**

**SUPER COUPON \$9.99** ~~\$12.99~~  
comp at \$17.97

80223943

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**PITTSBURGH** **SUPER COUPON**

**RAPID PUMP® 3 TON LOW PROFILE HEAVY DUTY STEEL FLOOR JACK**  
ITEM 61282 shown 61253/62326

Customer Rating **★★★★★**

**SAVE \$190**

**SUPER COUPON \$79.99** ~~\$269.99~~  
comp at \$269.99

82497830

LIMIT 5 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 6/2/17. Limit one coupon per customer per day.

**CENTRAL MACHINERY** **SUPER COUPON**

**12" x 33-3/8" WOOD LATHE WITH REVERSIBLE HEAD**  
ITEM 34706

Customer Rating **★★★★★**

**SAVE \$68**

**SUPER COUPON \$279.99** ~~\$319.99~~  
comp at \$347.99

80224243

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**THUNDERBOLT MAGNUM solar** **SUPER COUPON**

**45 WATT SOLAR PANEL 10 PIECE KIT**  
ITEM 62443 shown 68751 shown

Customer Rating **★★★★★**

**SAVE \$83**

**SUPER COUPON \$119.99** ~~\$203.73~~  
comp at \$149.99

80237476

LIMIT 5 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 6/2/17. Limit one coupon per customer per day.

**CENTRAL PNEUMATIC** **SUPER COUPON**

**HEAVY DUTY RETRACTABLE AIR HOSE REEL WITH 3/8" x 25 FT. HOSE**  
ITEM 69234 shown 69266

Customer Rating **★★★★★**

**SAVE \$82**

**SUPER COUPON \$47.99** ~~\$139.99~~  
comp at \$139.99

80236190

LIMIT 5 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 6/2/17. Limit one coupon per customer per day.

**WINTER SPORTS** **SUPER COUPON**

**EAR MUFFS**  
ITEM 94334

Customer Rating **★★★★★**

**SAVE 60%**

**SUPER COUPON \$3.99** ~~\$6.99~~  
comp at \$9.99

80238781

LIMIT 7 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 6/2/17. Limit one coupon per customer per day.

**Lifetime CARBIDE** **SUPER COUPON**

**ALUMINUM OXIDE SANDING SPONGES - PACK OF 10**  
COARSE ITEM 46751  
MEDIUM ITEM 46752  
FINE ITEM 46753

Customer Rating **★★★★★**

**SAVE NOW \$3.99** ~~\$4.99~~

82495925

LIMIT 7 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 6/2/17. Limit one coupon per customer per day.

**SUPER COUPON**

**27 LED PORTABLE WORKLIGHT/FLASHLIGHT**  
ITEM 67227 shown 69567/80566/62532

Customer Rating **★★★★★**

**SAVE 71%**

**SUPER COUPON \$2.99** ~~\$3.99~~  
comp at \$10.64

82501645

LIMIT 7 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 6/2/17. Limit one coupon per customer per day.

**HaulMaster** **SUPER COUPON**

**MOVER'S DOLLY**  
ITEM 60447/63088 shown 61899/62399/63095/63096 63098/63097

Customer Rating **★★★★★**

**SAVE 59%**

**SUPER COUPON \$7.99** ~~\$19.97~~  
comp at \$19.97

80231322

LIMIT 7 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 6/2/17. Limit one coupon per customer per day.

**HaulMaster** **SUPER COUPON**

**1000 LB. CAPACITY SWING-BACK TRAILER JACK**  
ITEM 69780 shown 41005 shown

Customer Rating **★★★★★**

**SAVE 54%**

**SUPER COUPON \$17.99** ~~\$24.99~~  
comp at \$39.94

80235688

LIMIT 5 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 6/2/17. Limit one coupon per customer per day.

**CENTRAL MACHINERY** **SUPER COUPON**

**2.5 HP 12" THICKNESS PLANER**  
ITEM 95082

Customer Rating **★★★★★**

**SAVE \$129**

**SUPER COUPON \$239.99** ~~\$299.99~~  
comp at \$369

80226371

LIMIT 5 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 6/2/17. Limit one coupon per customer per day.

**WINDSOR DESIGN** **SUPER COUPON**

**60", 4 DRAWER HARDWOOD WORKBENCH**  
ITEM 93454/69054 shown 63395/62603 shown

Customer Rating **★★★★★**

**SAVE \$265**

**SUPER COUPON \$129.99** ~~\$159.99~~  
comp at \$395

80232374

LIMIT 5 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 6/2/17. Limit one coupon per customer per day.



## CENTRAL PNEUMATIC

**3 GALLON, 100 PSI OILLESS AIR COMPRESSORS**

**A. HOT DOG**  
ITEM 69269/97080 shown

**B. PANCAKE**  
ITEM 95275 shown  
60637/61615

**YOUR CHOICE**  
**\$39.99**

**SAVE 59%**

Customer Rating **★★★★★**

**\$59.99**  
comp at **\$98.62**

825336657

**LIMIT 4** - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchase after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 6/2/17. Limit one coupon per customer per day.

## SUPER COUPON

# FREE

WITH ANY PURCHASE  
WITH ANY PURCHASE

**PITTSBURGH**  
**1" x 25 FT. TAPE MEASURE**  
ITEM 69030/69031 shown

**\$6.99**  
VALUE

**LIMIT 1** - Cannot be used with other discount, coupon or prior purchase. Coupon good at our stores, HarborFreight.com or by calling 800-423-2567. Offer good while supplies last. Shipping & Handling charges may apply if not picked up in-store. Non-transferable. Original coupon must be presented. Valid through 6/2/17. Limit one FREE GIFT coupon per customer per day.

825333864

## PITTSBURGH

**32 PIECE SCREWDRIVER SET**  
ITEM 61259/90764 shown

**SUPER COUPON**  
**\$5.99**

**SAVE 56%**  
**\$8.99**  
comp at **\$13.67**

Customer Rating **★★★★★**

82543867

**LIMIT 8** - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchase after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 6/2/17. Limit one coupon per customer per day.

## drill master

**ORBITAL HAND SANDER**  
ITEM 61509/61311 shown

**SAVE 66%**  
**\$9.99**  
comp at **\$29.97**

Customer Rating **★★★★★**

82519778

**LIMIT 8** - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchase after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 6/2/17. Limit one coupon per customer per day.

## CENTRAL PNEUMATIC

**18 GAUGE 2-IN-1 NAILER/STAPLER**  
CENTRAL PNEUMATIC

ITEM 63156/68019 shown

**SUPER COUPON**  
**\$15.99**  
comp at **\$99.99**

**SAVE \$84**  
**\$22.99**

Customer Rating **★★★★★**

82507441

**LIMIT 5** - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchase after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 6/2/17. Limit one coupon per customer per day.

## CENTRAL MACHINERY

**2 HP INDUSTRIAL 5 MICRON DUST COLLECTOR**  
ITEM 61790/97069 shown

**SAVE \$205**  
**\$799.99**  
comp at **\$384.99**

Customer Rating **★★★★★**

82532584

**LIMIT 3** - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchase after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 6/2/17. Limit one coupon per customer per day.

## PREDATOR ENGINES

**6.5 HP (212 CC) OHV HORIZONTAL SHAFT GAS ENGINES**  
ITEM 60363/69730 shown

**SUPER COUPON**  
**\$99.99**  
comp at **\$389.99**

**SAVE \$290**  
**\$119.99**

Customer Rating **★★★★★**

82508582

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## HaulMaster

**17 FT. TYPE I A MULTI-TASK LADDER**  
ITEM 62514/67646/62656 shown

**SAVE \$161**  
**\$119.99**  
comp at **\$281.87**

Customer Rating **★★★★★**

82526567

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## SUPER COUPON

**7 FT. 4" x 9 FT. 6" ALL PURPOSE WEATHER RESISTANT TARP**  
ITEM 69249/69115/69137/69129/69121/877 shown

**SUPER COUPON**  
**\$2.99**  
comp at **\$8.48**

**SAVE 64%**  
**\$4.99**

Customer Rating **★★★★★**

82532668

**LIMIT 6** - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchase after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 6/2/17. Limit one coupon per customer per day.

## US GENERAL

**16" x 30" TWO SHELF STEEL SERVICE CART**  
ITEM 60390/5107 shown

**SUPER COUPON**  
**\$29.99**  
comp at **\$59.98**

**SAVE 50%**  
**\$59.98**

Customer Rating **★★★★★**

82506818

**LIMIT 5** - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchase after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 6/2/17. Limit one coupon per customer per day.

## PITTSBURGH

**6" DIGITAL CALIPER**  
ITEM 61585/62387 shown

**SUPER COUPON**  
**\$9.99**  
comp at **\$29.99**

**SAVE 66%**  
**\$17.99**

Customer Rating **★★★★★**

82511670

**LIMIT 9** - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchase after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 6/2/17. Limit one coupon per customer per day.

## CHICAGO ELECTRIC POWER TOOLS

**10" SLIDING COMPOUND MITER SAW**  
ITEM 61971/61972 shown

**SAVE \$94**  
**\$84.99**  
comp at **\$179**

Customer Rating **★★★★★**

825339368

**LIMIT 4** - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchase after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 6/2/17. Limit one coupon per customer per day.

## HaulMaster

**4 PIECE 1" x 15 FT. RATCHETING TIE DOWNS**  
ITEM 63056/63057/60405/63094/63150/61524/62322/90984 shown

**SUPER COUPON**  
**\$6.99**  
comp at **\$34.95**

**SAVE 80%**  
**\$11.99**

Customer Rating **★★★★★**

82540969

**LIMIT 3** - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchase after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 6/2/17. Limit one coupon per customer per day.

## PREDATOR GENERATORS

**13 HP (420 CC) GAS GENERATORS**  
ITEM 68530/63086/69671/63085 shown

**SUPER COUPON**  
**\$529.99**  
comp at **\$999**

**SAVE \$469**  
**\$599.99**

Customer Rating **★★★★★**

82537988

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## CENTRAL MACHINERY

**4" x 36" BELT/6" DISC SANDER**  
ITEM 62502/97161 shown

**SUPER COUPON**  
**\$5.99**  
comp at **\$124.51**

**SAVE \$4**  
**\$79.99**

Customer Rating **★★★★★**

82642694

**LIMIT 4** - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchase after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 6/2/17. Limit one coupon per customer per day.

## HARDY

**MECHANIC'S GLOVES**  
ITEM 62429 shown

**SAVE 60%**  
**\$3.99**  
comp at **\$9.98**

Customer Rating **★★★★★**

825043371

**LIMIT 7** - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchase after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 6/2/17. Limit one coupon per customer per day.



# Technology And Woodworking

## What's New in Connected Tools?

By Chris Marshall

*Five mobile device apps let you tap into the latest batteries and tools like never before.*



Digital image courtesy of underworld1/Bigstock.com

### MORE ON THE WEB

For a quick video tour of several of these connected devices, please visit our website at [woodworkersjournal.com](http://woodworkersjournal.com) and click on "More on the Web" under the Magazine tab.

**T**hese days, it seems apps are expanding the possibilities of our smart devices about as fast as the IT coders can write them. So it's only logical that this burgeoning technology should influence the world of power tools, too. And now it has. BLACK + DECKER, DeWALT, General Tools & Instruments, Milwaukee and RYOBI are setting the bar with app-driven

innovations that will enable us to interact with lithium-ion batteries, cordless tools and measuring devices in groundbreaking ways. If you've ever wanted more security, customization and data reporting from your tools, these companies now offer free iOS or Android-friendly apps that expand the versatility of select new products. Here's a sampling of some of this "connected" tool wizardry.

### **B+D SMARTECH**

Last summer, BLACK + DECKER launched its 20-volt SMARTECH™ lithium-ion batteries that are compatible with the company's 20V MAX\* tool line and retail for around \$79. These compact batteries use Bluetooth® Technology to connect with the SMARTECH mobile app. Once you've paired the battery to the app with your tablet or

## Smarter Batteries



Customized apps from **BLACK + DECKER** and **DeWALT** can help you catalog and control their Bluetooth-enabled batteries using either **iOS** or **Android** phones and tablets.



smartphone, it offers helpful diagnostic and security features. The app will inform you about each battery's current charge level and provide a host of stats, including model and serial number, date code and when it was last paired with the app. Within Bluetooth range (around 100 ft.), you can locate your SMARTeCH battery with your device — the battery beeps loudly until you stop the search. Another tap of the app enables you to lock the battery, deactivating it from unauthorized use. They also have a handy USB port on top to recharge your mobile devices.

The app links to B+D's website, where you can find a library of free DIY and woodworking project plans, plus much more.

### DeWALT ToolConnect

DeWALT also has a pair of 20V MAX\* XR Bluetooth-enabled batteries in 2.0 Ah compact (\$99) and 4.0 Ah (\$139) sizes. They're fully compatible with its extensive 20V MAX\* tool family.

DeWALT's Tool Connect™ app pairs to these batteries easily with current smart devices, and each battery can be custom-named. The app offers a similar package of battery-specific identification and diagnostic tools as SMARTeCH: serial and model number, date code and last pairing date, charge level at present and current battery temperature.

But, unlike SMARTeCH's DIY/consumer-intended focus, DeWALT's Tool Connect program is geared to jobsite tool concerns and inventory management. For instance, within Bluetooth range, a Tool Connect user can be alerted when batteries are out of range, and users can set them to disable beyond this perimeter. You can also set alerts for low charge warnings or charging status, and temperature extremes. There's even a "Lend" feature: the app's calendar and clock can tell a battery to disable when its assigned loaned period expires. Then, the battery becomes inoperable and unchargeable by the

borrower, and the lender receives a reminder alert.

This much tracking information isn't as relevant for hobbyists, but imagine a jobsite running dozens of DeWALT batteries. There, inventory control is a daily concern, where Tool Connect can bring peace of mind.

### Milwaukee ONE-KEY

In 2015, Milwaukee launched its ONE-KEY™ mobile app and a number of ONE-KEY tools. With them, the



*Tool Connect lets you set a time and date for lending out a Bluetooth battery. At expiration, the battery turns off until you reactivate it.*



*In addition to powering tools, BLACK + DECKER's 20V SMARTeCH batteries also have a USB port for charging mobile devices — very helpful.*



*Aside from a Bluetooth symbol and indicator light, DeWALT's new "connected" batteries resemble standard 20V MAX\* DeWALT batteries.*

## LEARN MORE ONLINE

**Black and Decker SMARTeCH** <http://smartechn.blackanddecker.com>

**DeWALT Tool Connect** <http://toolconnect.dewalt.com>

**Milwaukee ONE-KEY** <https://www.milwaukeeetool.com/ONEKEY>

**RYOBI Phone Works** <http://www.ryobitools.com/phoneworks>

**General Tools ToolSmart** <https://www.generaltools.com/toolsmart>



# Technology And Woodworking continued

## Programmable Cordless



**Milwaukee's ONE-KEY Bluetooth-enabled tool family includes an LED Site Light, 1/4" Hex Impact Driver, 1/2" Drill/Driver and SAWZALL Reciprocating Saw, among several others.**

company adopted a different strategy from either B+D or DeWALT's approach: instead of enhancing batteries with Bluetooth connectivity, the tools themselves have Bluetooth. ONE-KEY tools operate on any M18™ Milwaukee battery, and the ONE-KEY app interfaces with the tool,

regardless of the battery it's using.

Currently, Milwaukee's M18 FUEL™ ONE-KEY-enabled tools include a 1/2" drill/driver and hammer drill/driver, 1/4" hex impact driver, 3/8" and 1/2" impact wrenches, several crimping tools and a SAWZALL® Reciprocating Saw. There's also a RADIUS™ LED Site Light that operates on either a battery or corded power.

Milwaukee's app offers a full complement of data tracking and security features. Once the app pairs to a tool, it logs serial number, date of purchase and current mapped location, along

with any notes the owner wishes to add. This information stores to the cloud and can be retrieved for online and mobile record keeping. And, if a tool in the ONE-KEY inventory should go missing, a user can report it as missing in the app. Then, any device with the ONE-KEY app will update the tool's location when it comes into Bluetooth range, and the owner will receive an email report of its whereabouts.

But inventory tracking is just one benefit of ONE-KEY. The app also allows these tools to be custom programmed by the end user for specialized or often-used tasks. Here's an example: Maybe you use a recip saw to cut cast-iron waste pipe some days, demolition materials on other days, then 4x6 timbers and sheet steel on occasion. Using the app, a ONE-KEY SAWZALL (model 2721-20, \$249) can be set for up to four different cutting "profiles" that best suit these varied materials. Starting and maximum speeds, trigger ramp-up time and even the tool's onboard LED work-light duration all can be set and stored, then saved and used independently of the app. A push button selector on the tool indicates which of the four modes you've chosen. Using your custom profiles can help the saw cut more efficiently or safely and even extend blade life.

Same goes for other ONE-KEY tools: the 1/2" Drill/Driver (model 2705-20, \$179)

*Continues on page 56 ...*



**Assign up to four custom profiles at a time through the app to the ONE-KEY 1/2" Drill/Driver, based on the bit type, size and material you're drilling into.**



**You can control Milwaukee's LED RADIUS Site Light entirely by the ONE-KEY app — helpful when it's placed in hard-to-reach spots or at inconvenient heights.**



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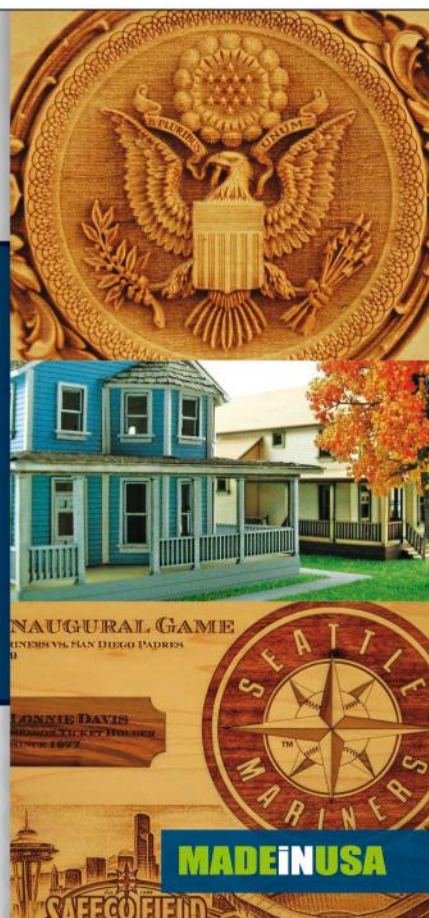


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# Technology And Woodworking continued

## Measuring and Inspection Gadgets



*General Tools & Instruments and RYOBI offer more than a dozen app-enhanced inspection and measuring tools combined, through their Phone Works and ToolSmart product lines.*

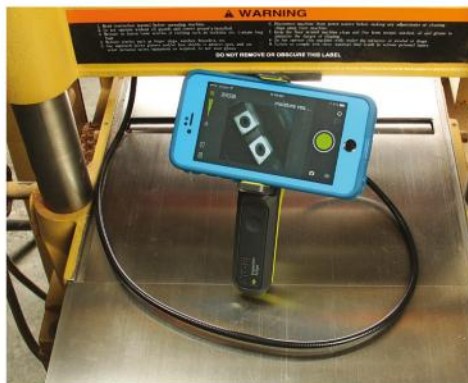
is programmable for various drill bit styles, diameters and materials being drilled. The app then adjusts the tool for optimal drilling speed and torque shutoff, which you can save as one of four custom profiles. The ONE-KEY 1/4" Hex Impact Driver (model 2757-20, \$179) lets you select the sizes and head types of self-tapping screws or concrete anchors you're planning to drive; the app responds by adjusting starting,

driving and finishing speeds accordingly.

Milwaukee's ONE-KEY RADIUS LED Site Light (item 2146-20, \$349) will brighten up dark spaces with up to 4,400 lumens, either standing on its base or hanging inverted from a self-centering metal hook. With the app, you can turn the light on or off, activate all 360° of its LED array or just one side at a time, and then adjust intensity to suit your needs.



*The ToolSmart Angle Finder measures wall corner angles. Send this data to the app, and it will provide miter saw settings for cutting crown molding to fit the corner.*



*Want to check the condition of your planer's carbide inserts? You could use RYOBI's Inspection Scope to look up inside the machine without disassembling it.*

When the light is plugged into an extension cord instead of a tool battery, you can schedule it for automatic on/off cycles or daisy-chain it to other RADIUS lights.

### RYOBI Phone Works

RYOBI offers a line of seven lime-green inspection and measuring gadgets that make up its Phone Works™ device family. Currently, Phone Connect includes laser pointer, level and distance measurers, noise-suppression earphones, a thermometer, moisture meter and inspection scope.

Most of these tools require your smartphone or tablet as an integral component to their operation. It serves as a display screen for what is being measured or viewed by the Phone Works instrument, and you can take still photos or videos of your subject, then superimpose the data onto it for record keeping. RYOBI has designed the Phone Works app to allow you to create "projects" on your phone or tablet and synthesize all of your data and photos or videos into a single folder to share with others by email or on social media.

I gave the Inspection Scope (model ES5000; \$67.48) and Infrared Thermometer (model ES2000; \$39.97) a try. The Inspection Scope pairs to a mobile device using Wi-Fi rather than Bluetooth, and it features a 3-ft. flexible cable with a tiny camera on the end. Four LED lights surround the lens to help lighten up dark areas. My iPhone 6S, with a full case, fit securely

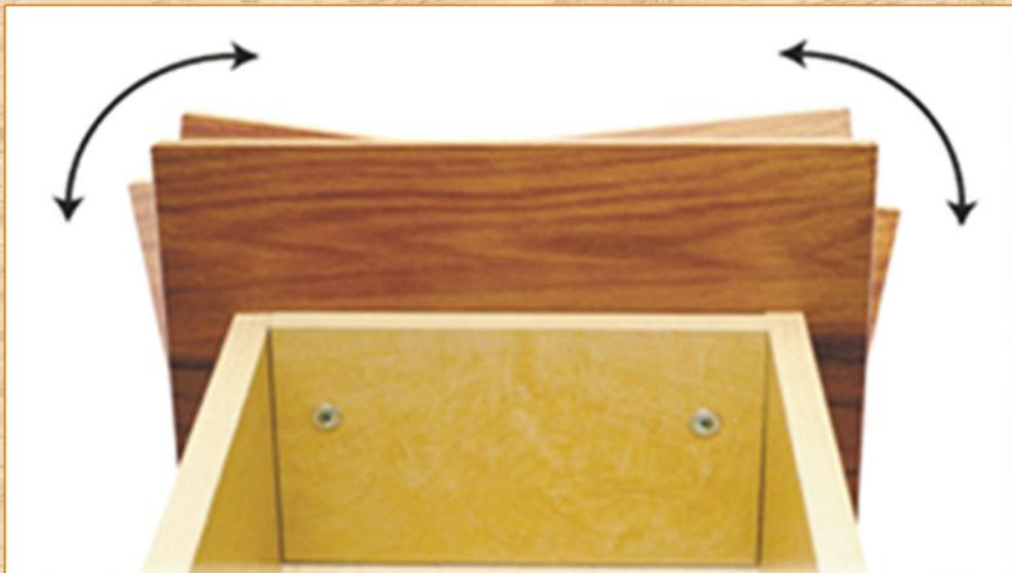
*Continues on page 58 ...*



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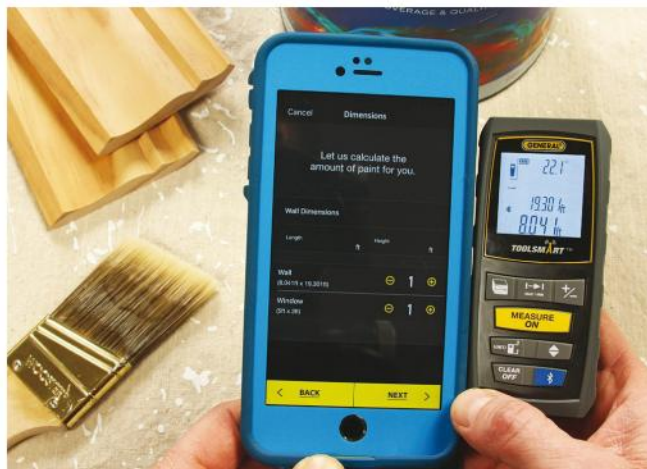
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# Technology And Woodworking continued



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**With RYOBI's Infrared Thermometer clipped to your smartphone and plugged into the headphone jack, you can determine the surface temperature of just about anything, instantly.**

onto the back of the device — both the scope and the thermometer come with a spring-loaded, adjustable clip that holds many sizes of smartphones (even big ones like mine).

In use, the image and video resolution was quite pixelated on my phone's screen, especially when viewing things in dark spaces, but I could still get the gist of what I was seeing pretty well. The device also seems to deplete AA batteries

fast. But, if you wish you could peer inside your machines without taking them apart, wonder what might be clogging a sink drain or need to take a look under shop fixtures, the couch or a car seat to find something gone missing, this doodad could be your second set of eyes.

RYOBI's Infrared Thermometer plugs into a device's headphone jack and functioned simply and reliably — in just a few app taps, its Class 3 laser will be pointing a beam and taking a continuous temperature reading where you aim it. It has a range of -22° to 662°F. Save the reading by tapping one button. Here could be a neat way to keep tabs on your tool motor heat output, check windows and doors for drafts or even investigate the efficiency of your home's HVAC duct system.

## General Tools ToolSmart

General Tools & Instruments also has a collection of Bluetooth-enabled measuring devices that include a laser distance measurer, angle finder, two versions of inspection cameras, digital multimeter, infrared thermometer and moisture meter. A ToolSmart™ app enhances their features and offers a similar “project” system to RYOBI's for organizing and sharing data. The tools can be used without the app, too.

I tried the Digital Angle Finder (model TS02, \$49.98). It works like a digital protractor to measure angles up to 225°. Here's what makes it unique: you can send the

angle reading (between two walls, for instance) to your mobile device without writing it down — handy if you're up on a ladder. Then, the app can tell you the correct miter and bevel angles for setting up a miter saw to cut moldings and crown. This sure beats trial and error!

Or consider the Laser Distance Measurer (model TS01, \$69.98): like most distance finders, it uses a laser to help you chart lengths. This one tabulates area and perimeter, volume and triangulated distances. However, the app makes the tool even more practical for DIY jobs. Measure and send it the lengths and widths of walls, floors or ceilings, and the app will calculate the amount of paint, wallpaper, molding or flooring your area will require. No need to crunch the math.

If you often wonder about your lumber's moisture content but don't have a way to check it — and we all should — the ToolSmart pin-style Moisture Meter (model TS06, \$39.99) can solve the conundrum. I wish it came with an adjustment chart for different wood species and temperature factors — other meters do. But it will give you a quick ballpark percentage to verify if your wood is dry enough for woodworking. It will assess building materials like drywall, too.

Smart devices and apps have quickly become an indelible part of our culture. You can be sure that their role in power tool technology will only grow with time.



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# Techniques

## Veneering with a Vacuum Pump

By Hendrik Varju

*A vacuum pump and veneer bag is a fully portable system that can be used anywhere. Here, learn some simple veneering techniques.*



Having helped wood-working students of mine build a vacuum pump set up from a kit, I decided it was time to invest in one myself. I chose a kit with a 3.15 cfm pump, which will handle 4'x 8' veneer bags for flat work and 4' x 4' bags for moderately curved work. The kit I bought at [joewoodworker.com](http://joewoodworker.com) came with all the main parts required. I simply built the wooden stand, supplied the PVC pipe and did a bit of wiring, all according to the detailed plans supplied with the kit. It resulted in a nice, tidy and mobile package.

I use a quality polyurethane bag, which is fairly expensive but offers good durability for professional use. For occasional use, a high quality vinyl bag will suffice and cost less.

### Commercial Veneers

In this article, I'm using commercially cut raw wood veneers in a species called makore. At only 1/42" thick, only light sanding can be done on the finished panel, not planing or heavy scraping. You can also cut veneer yourself with a good band saw (more about that shortly).

With commercial veneers, it's as simple as laying out the veneer sheets in sequence and flipping over every other sheet to achieve





**A jointed piece of hardwood makes for a solid straightedge you can safely run a veneer saw against. Here, the author crosscuts the veneer.**

a book-match. From a flitch of 24 sheets of veneer, I applied veneer to one side of an MDF panel using just sheet number 5. The original veneer sheet was long enough to provide two lengths of veneer for my panel, so I simply cut the sheet in half with a veneer saw and rotated one of the halves for the book-match. I didn't even need to flip one sheet over. With veneer this wide, I needed only two pieces with one joint to cover the entire panel on one side.

When using two or more pieces of veneer to cover a substrate, their aligning edges must be perfectly straight to avoid gaps (like a butt joint in thicker stock). I started by jointing the mating edges of

the sheets I had cut from the larger original sheet using a common flush-trim router guide. I sandwiched my two veneer sheets under a simple jig (photo above right) and on top of a sacrificial piece of 1/4"-thick MDF. By allowing the veneers to protrude slightly from the jig, it was easy to trim the edges with a straight bit in a router. To avoid tearout, given the tiny amount of wood being cut, you can safely climb cut.

I can trim a whole stack of veneers at the same time with this method. There's also an alternative method where I simply place the two veneer sheets against my jointer fence with a hardwood guide at the front. Then I joint the veneers and the solid board



**A flush-trim guide allows a router to trim the edges of several sheets of veneer at the same time. Sandwich the veneers between a piece of scrap MDF and the trim guide.**

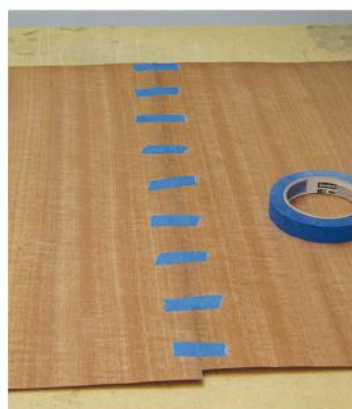


together. This works for shorter veneers like I'm using here, but the trim guide is best for long veneers that are unwieldy to handle.

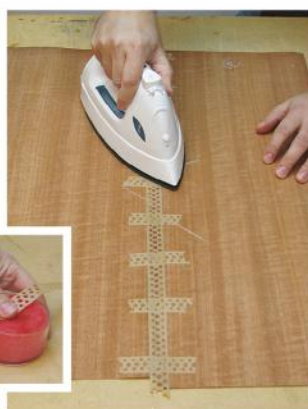
After jointing the edges, I secured the veneers together using blue tape placed across the joint every few inches on the back side. Then I applied veneer tape on the front side, first across the joint and then one long piece along the joint. This tape has an adhesive on the back so I just run the back over a wet sponge before laying it down. With that done, an iron set to medium heat shrinks the veneer tape as it



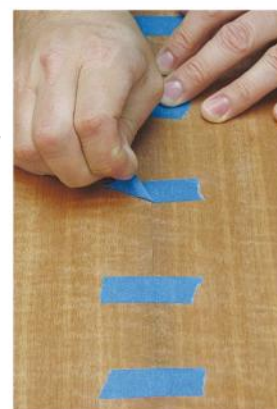
**Sandwiching short veneers between a piece of wood and the jointer fence will allow you to joint edges even faster than with a router.**



**Blue painter's tape pulled tight across the joint every few inches will hold the back side of the veneer sheets together well.**



**Now dampen the perforated veneer tape (inset) and stick it onto the front side in the same way, along with one long piece down the joint. A hot iron makes the tape shrink and pulls the joint tighter. Remember to remove the blue tape from the back side of the veneers before gluing.**





one of these other styles. The key is a complete hardware kit from Rockler that includes a metal bed frame with a pneumatic lift system and a wooden slat platform that acts like a box spring. If you decide to build one or both of the side cabinets shown here, this project offers plenty of additional shelf and cabinet storage, too.

I made my queen-size Murphy Bed using birch lumber and birch plywood because its tight grain is great to paint. And to that end, you'll see later that I've applied "modern" milk paint (no milk required!) to the birch, followed by two coats of clear flat (sheen) water-based finish to add durability and luster. But if you'd prefer a "natural" wood look instead, or want to match this project to existing trimwork, any species and finish will be good substitutes for birch. It's up to you.

Of course, not everyone needs a queen-size bed, so material lists for twin and full-size beds are available in the "More on the Web" online content for this project. Rockler sells twin- and full-size Murphy Bed hardware kits as well.

## Construction Notes

In addition to the usual woodworking machines and router bits, to build this bed you'll also need a pocket-hole jig, biscuit joiner and a few other specialized items: a 35 mm drill bit, shelf pin drilling jig and an inset hinge baseplate drilling jig. You'll also need a dozen or so 18" bar clamps, a few 7' pipe clamps and at least 20 medium-size Rockler Bandy Clamps or other three-way edge clamps if you want to speed up clamping the edging strips to the plywood.

Here's a rough account of sheet goods, wood and molding you'll need: for the bed cabinet, buy four full sheets of 3/4" plywood, 30 board feet of birch and 10 lineal feet of 4 1/4"-wide crown



**Glue and clamp the 3/4"-thick edging pieces to the bed cabinet plywood. Place bar clamps at 6" intervals. Clean up wet glue squeeze-out with a rag, and scrape the rest away after it has cured.**



**Glue and clamp the 1/8"-thick edging pieces to the edges of the upper and lower back panels. A bunch of Rockler medium-size Bandy Clamps makes quick work of this task. Push them down as hard as you can to apply maximum pressure for tight glue joints.**

molding. Each of the side cabinets will require one full sheet of 3/4" plywood, one 2' x 8' half sheet of 1/4" plywood and 3 board feet of birch.

While this is a large project, it's not hard to build. However, it does require a big workspace when you get to the pre-finish assembly of the bed cabinet and frame. A one-stall garage or similarly sized workshop should be enough space to tackle this project. I've designed the bed cabinet to be knockdown, because it's so large that in almost every instance it would be too big to maneuver from your shop into the room where it will be mounted. You'll

use biscuits (no glue) to align most of the joints and pocket screws to assemble the knockdown parts.

Be prepared to cut away baseboard where you plan to mount the bed and side cabinets to your wall. Also, aside from being dangerous if not mounted securely to wall studs, the bed will not function properly either. You must use the "bed-to-wall" brackets included in the hardware kit.

## Assembling the Bed Cabinet

Let's get started by cutting the bed cabinet box pieces 1 through 5 to size, according to the *Material List* dimen-



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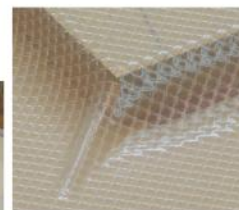
# Techniques continued



**Dark pencil lines on the substrate indicate if you're using the right amount of glue. You should see the pencil lines through the glue, but not too clearly.**



**Place the panel veneer-side down into the veneer bag and on top of the platen, breather mesh on top (inset). Then seal the bag tightly.**



## Shop-cut Veneers

Working with shop-cut veneers isn't that different, except that you cut them yourself. Start by finding a piece of lumber that has no grain reversals or only very minor ones. Choosing stock with grain switches and unusual figure will cause all kinds of tearout when jointing and planing, unless you have helical cutterheads or a thickness sander. For really highly figured stock, I prefer commercial veneers since they can be flawless right out of the box.

Sometimes I need to use liquid veneer softener (shown at right) to flatten badly curled or wavy veneer.



**Veneer softener**

Joint one face and one edge of the stock and bring the second edge to final

didn't need an upper platen, nor did the lower platen need to be grooved for proper evacuation of air from the bag. In the past, most people used both an upper and lower platen for flat veneering, although an upper platen can't be used with curved work. With the use of breather mesh, though, one can eliminate the upper platen entirely, even with flat work. (I purchased breather mesh from [veneersupplies.com](http://veneersupplies.com).)

I've done various experiments to get around bleed-through, which can occur when the vacuum pressure forces glue right through the veneers, interfering with stains and finishes. From my

experiments, I've had great success setting the vacuum pressure to just 17 Hg (inches of mercury) for the first 10 minutes and then increasing it to 21 Hg for another 30 to 40 minutes. For more porous veneers such as burls, it's best to use a powdered plastic resin glue, which really reduces bleed-through.

Remember that the glue-up should not remain in the bag longer than an hour when using cold press veneer glue, as it needs exposure to air for the glue to dry properly. Also, keeping the panel under vacuum for too long with a water-based glue can cause mold spores to grow, producing unsightly stains.

**Basic resawing techniques allow you to make your own thicker veneers. The author likes to make them 3/32" thick, flattening one face of the stock on his jointer between slices on the band saw.**



**An auxiliary bed (here, a piece of 3/4" melamine) in your thickness planer lets you plane the bandsawn side of the veneers smooth and to final thickness.**

*Continues on page 66 ...*

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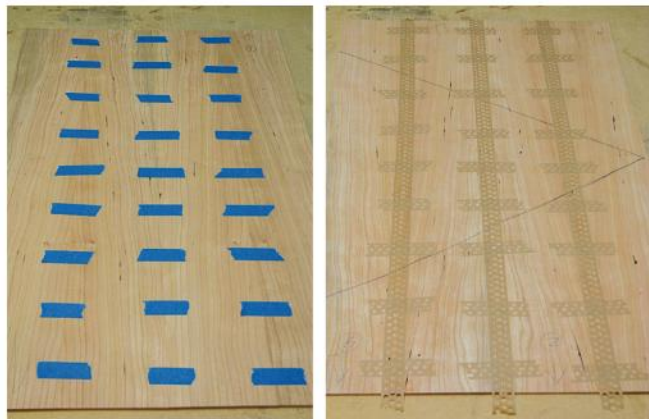
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# Techniques continued



***This glue-up has four shop-made veneer slices and three book-matched joints. You'll need a lot of tape to hold everything together.***

width with a table saw and thickness planer. Then cut a sheet of veneer off on the band saw, rejoin the face of the blank, and cut another sheet of veneer. By jumping between jointer and band saw, you can cut multiple sheets of veneer that are already smooth on one side and both edges (you'll still need to rejoin edges before taping to get really tight joints). A few quick passes through the thickness planer with an auxiliary bed brings them to final thickness. I'd suggest veneers at least 1/16" thick, though I prefer 3/32", which allows me to do some hand planing and scraping on the finished panels if necessary. Be sure to make similar thickness



***After the glue-up has dried, spray or brush distilled water over the veneer tape to soften it up for easy removal.***



***A dull putty knife will easily scrape off the softened veneer tape. A card scraper also works well.***

***The heart of the whole system is this small vacuum pump. It can be set to automatically stop at a given vacuum pressure, as shown on the gauge.***



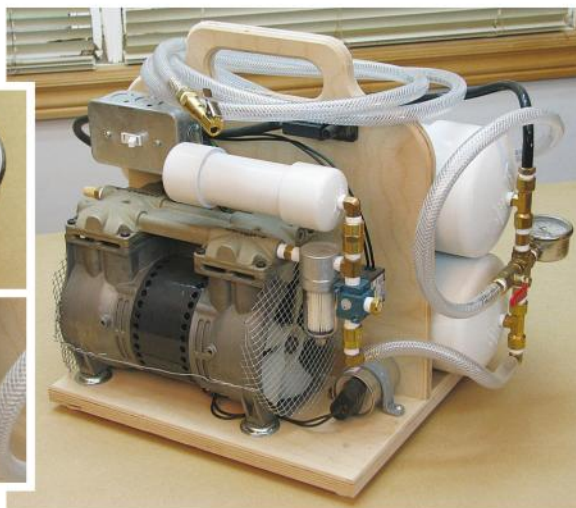
veneers for the back, using a less expensive species if you like. I don't recommend 3/32" face veneers and 1/42" commercial backer veneers because the panel needs to have a balanced veneer thickness to resist warping.

The panel I glued up here is no different than the one with commercial veneers except that I used narrower pieces requiring three joints. I also flipped every other piece of veneer to get my book-match. Other than needing a lot more tape, the process is much the same. In this case, I didn't veneer any edges, which wouldn't be necessary when making a panel for a frame-and-panel door, for example. I also used a Baltic birch core instead of MDF, which lightens the weight and eliminates the need to sand the core material. Another suitable core material would be particleboard. Baltic birch is nicer to work with, but not as flat and consistent in thickness as particleboard and MDF.

## Conclusion

While I've used veneered plywood my entire career, I only did my own veneering on occasion on very small panels using lot of clamps and clamping cauls. Owning a vacuum pump certainly makes veneering easier and opens up a lot of possibilities with exotic, highly figured veneers, such as pomelle figured sapele panels, which are just gorgeous. As an added benefit, I also regularly use the vacuum pump to glue two 1/4" sheets of veneered plywood back-to-back when I need 3/8" to 1/2" ply. I find that 1/4" and 3/4" ply is widely available, but in-between sizes are harder to find. Give a vacuum pump a try, and I think you'll be hooked in no time.

*Hendrik Varju is a fine furniture designer/craftsman who provides private woodworking instruction, seminars and DVD courses. His business, Passion for Wood, is located near Toronto, Canada. See [www.passionforwood.com](http://www.passionforwood.com).*





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# Weekend Projects



## Thinking-of-You Clock

By Kimberly McNeelan

This twin clock's unique styling can be adapted to many purposes. You could set your local time in the top clock and the time of a loved one who resides in another time zone in the lower clock, next to a picture of that person. He or she may be in the military, away at school or even on an African safari! Another idea is that you could make the project without the upper clock and just put a picture of anything or anyone you love in the frame. Either way, you'll have a handy key ring holder and chalkboard for reminders or inspirational quotes. However you choose to set it up, this attractive and multi-functional project also incorporates many different woodworking techniques to try.



### Getting Started

Just about any wood species will work well for this clock. We chose soft figured maple and finished it with shellac. The shellac adds a warm golden tone to the wood, which matches the gold trim on the clocks. It also highlights the figure, while being easy to apply and fast-drying.

Start by making the main panel that will become the body of the clock. The body finishes to 11¼" wide, so if you can't find a piece of wood that wide, you will need to glue it up. If that is the case,

take the time to arrange the grain pattern in a pleasing way. Make the blank oversized to start with. Clamp up the panel and set it aside for now.

Rough cut pieces oversized in width and length from extra stock for the top and bottom moldings. The molding for the bottom portion should be oversized in width by at least 2" to make ripping on the table saw safer. Now cut two pieces for the top built-up molding to the exact size shown on the *Material List* on page 70.



*After the side sections of the clock body were ripped free, the author cut away the top section. With care, when the pieces are glued back together, the grain will match well.*

## Forming the Body

To get started on the body, you will be doing a bit of addition by subtraction. At the table saw, rip  $1\frac{5}{8}$ "-wide pieces off the edges of the blank and set them aside. Once you've cut the next parts, you will glue these pieces back together; mark them now so you'll know what their arrangement should be. Next, using the crosscut sled on your saw, cut off what will be the top section of the body from the remaining section of the blank (lower photo, opposite page) and then cut off the lower component.

Test-fit the pieces together and measure to check your dimensions. Make any adjustments necessary. When you glue up the panel, align the top and bottom sections perfectly flush with the side lengths, leaving an 8" x 12" chalkboard space (photos at right). Scrape off glue squeeze-out when it is still tacky. Once the glue joints dry, sand the panel up to 120-grit.

## Routing Decorative Molding

Setting the body aside for now, grab the molding stock you cut up earlier. Chuck an ogee router bit in your router table, because it's time to rout the molding.



*Use extreme caution when routing the end grain of the top molding. Set the fence very close to the bit and form the ogee in a series of deepening passes. Back up these cuts with a miter gauge and sacrificial fence to improve safety and control.*



*The center section of the body blank is removed to make room for the chalkboard.*



*Remember to clean wet glue out of the corners before it hardens.*

Shaping profiles into the two top molding pieces is a multi-step operation. Rout the ends of the moldings first. Use a miter gauge with a sacrificial piece of stock behind the workpiece to avoid tearout and to make the cut safely. Shape the profile in several passes, raising the bit a little each time to remove more wood. For each pass, shape the long edges after you've routed the short ends.

When you are done with the top pieces, grab the material for the

*Cutting and regluing the clock body blank ensures perfectly square corners for the chalkboard cutout while keeping the overall grain pattern nearly seamless and intact.*

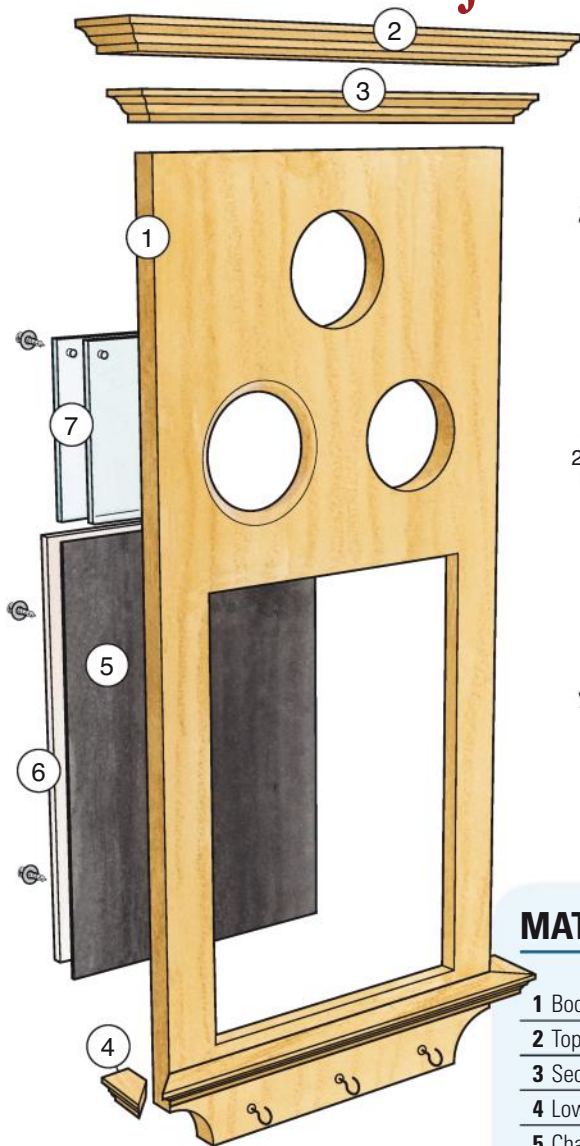
lower molding. Machine one of its long edges, starting with a lowered bit as before. When you've got the shape you want, rip the molding to its final width as shown in the photo below. Now you need to wrap the lower molding around the body. We used a miter saw to make



*The author made the bottom molding blank overly wide so the routing process would be safer. After the edge was shaped, she ripped the piece to its final width.*

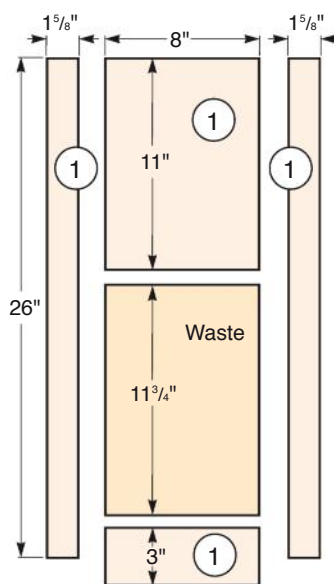


# Weekend Projects continued



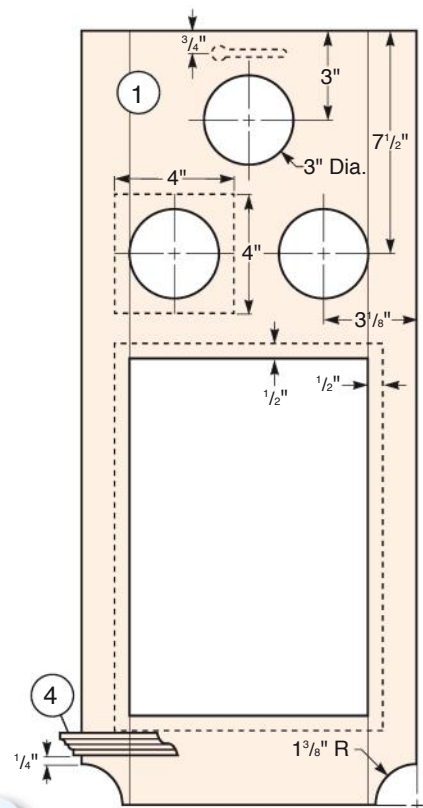
**Exploded View**

**Body Blank**  
(Front View)



The body blank starts as a single piece, then is cut apart as shown above. It is reglued later.

**Body**  
(Front View)



## MATERIAL LIST

	T x W x L
1 Body Blank (1)	3/4" x 11 1/2" x 26"
2 Top Molding (1)	3/4" x 1 7/8" x 13 1/2"
3 Second Molding (1)	3/4" x 1 3/8" x 12 3/8"
4 Lower Molding (1)	3/4" x 3/4" x 16"
5 Chalkboard (1)	1/16" x 9" x 13"
6 Backing Board (1)	1/8" x 9" x 13"
7 Plexiglass (2)	1/8" x 4" x 4"

## MORE ON THE WEB



For videos on using a keyhole routing bit and a square-hole routing

jig, please visit [woodworkersjournal.com](http://woodworkersjournal.com) and click on "More on the Web" under the Magazine tab.

the cuts. Mark out the miters as shown in the photo at right, and set up your saw for the cuts. We recommend adding a 3/4"-thick sacrificial fence and also using a piece of thin hardboard or plywood to make a zero-clearance insert for your saw. Cut the short "return" pieces (left and right) from the molding first. Then miter-cut the long front section. Once everything fits properly, set the moldings aside — you'll attach them to the body later.

### A Body Shape-up

In order to make this project hold two clocks and hang on the wall, we've got a few more machining chores to complete. To make the decorative arcs on the lower corners of the body, use a



Make a tick mark on the molding while holding it against the panel (inset). Then use your combination square to mark the 45° cut line for the "return" ends of the bottom molding strip.



You might need to put a new zero-clearance fence on your miter saw because the pieces are so tiny. Also, let the blade completely stop in the down position once you make the cut so that the little pieces don't get jammed or catch and fly.

The author used her thumb to support the compass point on the corner of the board as she drew each of the two 1 $\frac{3}{8}$ "-radius quarter circle profiles.



compass to draw the 1 $\frac{3}{8}$ "-radius circle cutouts on the bottom corners (see photo above). Then cut the quarter circles out at the band saw or with a jigsaw. If you have a spindle sander, use that to sand these curves. Otherwise, you can wrap a large dowel with coarse sandpaper to remove the saw marks and smooth the edges.

Next, lay out where the holes for the clocks and picture will go. There are a few ways to make these holes. The most straightforward, of course, is to use a 3"-diameter Forstner bit in a drill press (see the photo on the following page). If



*Cut inside the pencil lines of the curved corners so that you have a mark to sand up to. Once these cuts are done, remove the saw marks using a spindle sander or dowel wrapped in sandpaper.*

you don't own a Forstner bit that large and you don't want to spend the money to get one (they are not cheap), you could use an adjustable circle cutter instead — take your time and drill slowly,

keeping your hands well away from the cutter's spinning shaft. A third option would be to make a template with a 3"

*Continues on page 72...*

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# Weekend Projects continued

hole that you can use to guide a router and a long piloted pattern bit. Or, bore these holes with a 3" hole saw bit.

One of the cutouts also needs a 4"-square housing milled behind it (see *Drawings*, page 70, and *sidebar* below). Rout the "square" hole and then cut two pieces of 1/8"-thick plexiglass to fit the opening. These will hold your forget-me-not photo sandwiched between them. You can cut plexi on either a table saw or band saw using most quality blades. For that same picture hole, use a 5/16" roundover bit in a router to profile and soften the front edge of the opening.

Another routing task on the agenda is creating a keyhole slot in back to hang the clock on the wall. The *sidebar* on the opposite page describes this.



The large opening that will receive the chalkboard needs to have a rabbet formed into its back edge, too. Use a 1/2" rabbeting router bit on the router table to mill the rabbet. Make a few passes of no more than 1/16"- to 1/8"-deep at a time until you've reached 1/4"-deep. You may need to make climb cuts if the grain direction is



**Mark centerpoints for the hole cutouts (inset), then bore them at the drill press with a 3" Forstner bit or circle cutter. Whenever using a bit this large, first clamp the workpiece down securely.**

## Square Hole Routing Jig



To form the "square hole" — technically called a housing — that captures the plexiglass pieces, we used a router with a bearing-guided pattern-making bit.

You can get rather fancy making an adjustable jig for routing squares and rectangles. We simply clamped oversized straight pieces of wood in a configuration the exact size of square we needed to cut. Your router base will tell you how wide the jig pieces need to be in order to have room for clamping and not hit the router.

In this case, our author used 4"-wide side pieces to make clamping and acquiring the desired dimension easier. She also used a scrap piece 4" wide space to lock in the other 4" dimension. You will need a scrap piece under these pieces to provide a good way to clamp everything securely (see the large photo at right). Plunge your router and cut a 1/4"-deep, 4" x 4" square. Take several passes to minimize burning. Moving the bit's bearing against the jig's edges in a clockwise motion, remove only about 1/16" material at a time. Adjust the depth of the router bit after each pass. To be safe, make sure you unplug the router while making adjustments.

Then use a mallet and chisel to square the corners of this rabbet. The jig gives you a nice reference surface for more accurate chiseling (inset photo).



**Here the author makes a "jig" from scrap lumber clamped securely in place.**



# Using a Keyhole Bit



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The most important thing in using a keyhole bit is to make the cut in one pass, then turn off the router and remove your stock. That means it is important to test the cut on scrap stock — not only to check out the position and depth of cut, but the process of making the cut.



**A keyhole slot is a great way to hang flat panels like this project.**



**To avoid crinkling the metal chalkboard edge as you cut it, orient your tinsnips so the bottom blade is on the waste side of the material.**

causing any tearout. Then use a sharp chisel to square up the corners.

Now would be a good time to cut a piece of backer board that secures the chalkboard. Then cut the sheet metal

magnetic chalkboard with tinsnips to fit its opening. The metal may crinkle a bit as you cut it, but remember that the chalkboard fits into the rabbet and is held in place by the backer board, so

some edge roughness will be hidden. Still, cut the metal carefully to avoid excess distortion or raggedness (photo above). Practice by making a test cut or two.

*Continues on page 74 ...*



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# Weekend Projects continued



**Drill shallow pilot holes for #8 screws that will hold the plexiglass pieces in place.**



**Use a 5/8" Forstner bit to make 1/8"-deep countersunk holes for housing the washers that hold the backer board and chalkboard in place. Locate the tip of the Forstner bit about 1/8" away from the rabbet to start drilling.**

## Completing Last Details

You are almost done! Drill 1/8" holes in two of the corners of the plexi so that you can use #8 x 1/2" screws and washers to hold the picture in place. Drill pilot holes for the screws into the wood with a 3/32" drill bit. Go ahead and pre-drill for the cup hooks on the front. If you are careful, you can also drill pilot holes for the screws with washers that will hold the chalkboard in place.

Sand the main wood panel up to 220-grit. Then, attach the top moldings to the body. We used glue and a pneumatic brad nailer to speed this operation up.

Next, glue and clamp the lower molding pieces in place. This time, we used a few pin nails on the underside of the bottom molding in the front and on the sides where they were not as visible. Remove any glue squeeze-out as needed.

Once the glue dries, make sure everything is sanded up to 220-grit. The mitered corners and all edges need to be softened now. Break the edges by hand sanding with 320-grit paper, and go over the front panel with the same grit.

You are ready to apply finish. Our



**The author clamped the top molding pieces down one at a time to be sure they were as snug as possible. Then she used a brad nailer and glue to secure them permanently.**

author used five light coats of spray-on shellac. Wait until it becomes tacky before re-spraying. When the finish cured, she used steel wool to apply furniture paste wax to even out the shellac and take down its glossy sheen. Work in small areas, and buff off the wax before it dries with a soft cloth. Another benefit of wax is that it makes surfaces soft and smooth to the touch.

Now all you need to do is screw the chalkboard and the picture in place and install the cup hooks. Set the clocks to the appropriate times, and just pop them into place in their holes. Super easy.

You can use a plastic drywall anchor to hang this piece on the wall. Different sizes can hold up to 50 pounds.

We hope that whomever you make this project for will return safely home or visit often in order to see your lovely craftsmanship and expression of love.

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Striker Concepts  
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The *Miter Fold Dado Set* from **Rockler** turns a flat sheet of plywood into a box (four sides and a bottom) in just four passes on the table saw. The joints created with the set fold on the outer layer of plywood, which means each corner of the box features a unique continuous grain — and the box has the appearance of a solid piece of wood. This product includes a custom 8" miter fold blade; two full outside 8" dado stack blades; 1/4", 1/8" and 1/16" chippers; and 0.1 and 0.2 millimeter shims. All of the blades are steel with carbide tips. You can use the full dado stack separately from the custom miter fold blade, but not vice versa: the custom profile blade cannot be used with other dado stacks. The Miter Fold Dado Set (item number 54799) is currently available for pre-order at Rockler, with full availability in May. It's priced at \$349.99.

IRWIN Tools One-Handed Bar Clamps



**IRWIN® Tools** has updated their line of *One-Handed Bar Clamps*, as well as adding new accessories for the line. The updated One-Handed Bar Clamp (OHBC) line includes both Heavy-Duty and Medium-Duty clamps, which can sustain 600 and 300 pounds of force, respectively. The clamps also include a Quick-Change push button in order to easily convert the clamp into a spreader, or to install accessories. The swivel jaws in the updated OHBC line are removable so that you can modify the jaw position of the clamp based on the job requirement.

The Heavy-Duty clamps are available in six sizes (6", 12", 18", 24", 36" and 50"), and the Medium-Duty clamps

are available in five sizes (6", 12", 18", 24" and 36"). IRWIN has also redesigned its Mini (6" and 12") and Micro (4 1/4") OHBC clamps. Accessories added for the line include items that transform the OHBC into an edge clamp and a corner clamp; wide pads; a hold-down jig to turn an OHBC into a table clamp; a clamp coupler to increase the bar length by joining two smaller OHBC together to make one larger clamp; a deck tool for lining up, spacing and holding boards; and a stand for level clamping applications.

Pricing for the OHBC line ranges from about \$13 for the smallest Medium-Duty clamp to about \$70 for the larger Heavy-Duty clamps.



*Infinity Cutting Tools Tapered Dovetail Spline System*

The *Tapered Dovetail Spline System* from **Infinity Cutting Tools** consists of an extruded, anodized aluminum router jig that works together with a brass guide bushing to create a tapered dovetail groove in the corners of boxes. A CNC-machined, high-density polyethylene table saw sled automatically creates the correct taper when cutting the dovetail splines to fit the routed grooves in the box. The system works with either handheld or table-mounted routers, and the sled works on most right- and left-tilt table saws with 3/4"-wide miter slots. The stop block on the fence ensures repeatable widths for the splines.

The dovetail router bits that are part of the system create unique designs.

Two router jig sizes are available; the system comes in packages with the 12" router jig plus 1/2" x 14° dovetail bit; 18" router jig with 3/4" x 14° dovetail bit, or with both sizes of router jigs and six dovetail bits. A four-piece router bit set for the system, consisting of 3/4" x 18°, 1" x 18°, 1" x 14° and 1/2" by 18° bits, is sold separately. Prices range from \$93.60 for the router bit set to \$359.70 for the system package including both sizes of router jig.

The **Kreg® Custom Pocket-Hole Plug Cutter** lets you create your own pocket-hole plugs from any wood species (including your own stock, to match color and grain) and create face-grain plugs to blend in with a project more than visible end grain. The

*Kreg Custom Pocket-Hole Plug Cutter*



Custom Pocket-Hole Plug Cutter fits into a Kreg Jig (K5, K4 or K3) in place of the normal drill guide block. A specially designed plug-cut-

ting bit fits into any drill. To cut the plugs, just bore the holes as you would when creating pocket-holes. The bit is fluted to reduce heat and friction, with a positive stop collar to ensure the right depth for correct sizing. Cut the plugs you've drilled free with a band or hand saw. Optional bits (sold separately) allow the Plug Cutter to work with Kreg Micro-Pocket and Kreg Jig HD pocket holes. Pricing is \$69.99.

**Festool** has introduced two new 250-watt orbital sanders to the U.S. and Canadian markets. The *DTS 400 REQ* is a corner and edge finish sander designed for small, angular surfaces. The *RTS 400 REQ* is a finish sander designed for flat, vertical and overhead surfaces. Both are designed for one-handed use and have step-less variable speed from 6,000 to 12,000 rpm with a sanding stroke of 2 millimeters. New features include a pad protector to minimize pad damage and protect adjacent surfaces; a rubberized overgrip; bayonet-style dust port connection; and an optional, reusable filter bag with quick release. Both sanders weigh 2.4 pounds and have a 25% increase in power over previous models; they use a 250-watt motor with Festool's MMC electronics. The *DTS 400 REQ* and *RTS 400 REQ* are both priced at \$260.

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For videos demonstrating the Rockler Miter Fold Dado Set and other featured tools, please visit [woodworkersjournal.com](http://woodworkersjournal.com) and click on "More on the Web" under the Magazine tab.

*Festool DTS 400 REQ and RTS 400 REQ orbital sanders*





# What's In Store continued



Hitachi NT1850DE Cordless 18-Gauge Brad Nailer



Hitachi NT1865DM Cordless 16-Gauge Finish Nailer



Hitachi NT1865DMA Cordless 15-Gauge Angled Finish Nailer

**Hitachi's** three new cordless finish nailers are an 18-gauge, 2" Cordless Brad Nailer (model NT1850DE), 16-Gauge, 2½" Cordless Straight Finish Nailer (model NT1865DM) and a 15-Gauge, 2½" Cordless Angled Finish Nailer (model NT1865DMA). The trio is powered by Hitachi's new upgraded Compact 3.0Ah Lithium Ion battery. Hitachi's Multiplex Protection Circuit prevents battery overload, over-charge and over-discharge.

The nailers' driving system is similar to Hitachi's pneumatics: compressed air drives each nail, leading to zero ramp-up time between shots, increased shooting speed, recoil with the feel of a pneumatic nailer, better flush driving (even at an angle), and fewer internal parts to maintain.

A tool-less depth-of-drive dial can be adjusted to woods



Striker Concepts FLEXiT 4.0 light

of varying density, and a selective actuation switch provides either sequential or bump fire modes. As a safety measure, power automatically shuts off after 30 minutes of inactivity.

The NT1850DE Cordless 18-Gauge Brad Nailer accepts 5/8" to 2" fasteners, is capable of driving up to 1,650 nails per charge and weighs 7.3 lbs. It's priced at \$339.97. The NT1865DM Cordless 16-Gauge Finish Nailer accepts 1" to 2½" fasteners, is capable of driving up to 1,500 nails per charge, and weighs 7.3 lbs. Price is \$369.97. The NT1865DMA Cordless 15-Gauge Angled Finish Nailer accepts 1¼" to 2½" angled fasteners, shoots up to 1,100 nails per charge, and weighs 7.5 pounds. It's also priced at \$369.97.

**Northern Tool + Equipment** recently launched a new 3-in-1 Convertible Logging Wagon under its **Bannon** brand. It has a hauling capacity of 1,800 pounds (36 cubic feet) in a large capacity bed (72" long x 38" wide). A multi-function hitch handle allows you to pull the wagon by hand, tow behind

an ATV with a pin-style hitch, or add a 2" channel trailer coupler for connection to an ATV or tractor. Removable bolsters and a mesh cargo keeper allow you to convert the wagon easily to a flatbed for loading and unloading. Pneumatic tires with dual supports and beam axles keep the wagon balanced and centered on any terrain. The 3-in-1 Convertible Logging Wagon can hold logs up to 8 feet long. Maximum speed is 10 miles per hour. The 3-in-1 Convertible Logging Wagon is priced at \$799.99.

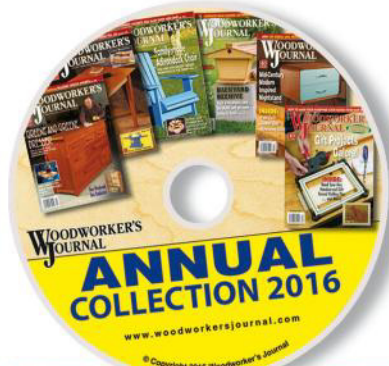
The **FLEXiT 4.0 light** from **Striker Concepts** is a hands-free, flexible LED task light. The Shape-Loc™ frame can wrap around tubes, bend into tight corners and magnetically fasten to metal objects. The FLEXiT 4.0 emits 400 lumens from a high-output CREE LED spotlight surrounded by 10 wide-angle LEDs. It's also equipped with four red LEDs for night vision and a two-color, rapid flashing hazard light. The base contains two rare-earth magnets and features a loop to hang or mount the light. The FLEXiT 4.0 is powered by three AA batteries (included) and is priced at \$39.99.



Bannon 3-in-1 Convertible Logging Wagon



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# Woodworking Tools & Supplies Index



## April 2017

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# Finishing Thoughts

## Good, Old-Fashioned Oil Varnish

By Michael Dresdner

*Varnish: still handy after all these years.*



**Michael Dresdner**

is a nationally known finishing expert. He shares his expertise on the DVD *The Way to Woodwork: Step-by-Step to a Perfect Finish*, available through the store at [woodworkersjournal.com](http://woodworkersjournal.com).

### MORE ON THE WEB

 For a video demonstrating brushing on varnish, as well as cleaning the brush, please visit [woodworkersjournal.com](http://woodworkersjournal.com) and click on "More on the Web" under the Magazine tab.

Originally, the word "varnish" meant a mixture of natural resin and drying oil. Today's oil varnishes usually contain synthetic resin, but like their ancestors, they're durable, beautiful and easy to apply.

Unfortunately, the term varnish may be used for almost anything that contains resin, and that confuses the issue. Before we settle our focus on the use and handling of oil varnish, let's take a quick look at some of the other coatings called varnish.

### The "Other" Varnishes

Spirit varnish is made of just resin and solvent with no oil. Shellac is a spirit varnish, as are other resin and alcohol mixtures. Not surprisingly, they handle like

shellac, meaning they can be sprayed, brushed or French polished, and dry faster than oils. Once cured, they are usually more brittle and less durable than oil varnish.

Conversion varnish (or catalyzed lacquer) is a chemically cured, two-part coating designed to handle like lacquer but be as durable as oil varnish. Thus it is formulated to be sprayed and to dry very fast, but over time it cures to a much more durable finish than lacquer.

Water-based varnish is the newest and most confusing, since that term can cover anything from a modified oil to water-based lacquer. Therefore, its flexibility and durability can vary widely.

Waterborne coatings have some or all of their solvent



**On flat surfaces, apply water-based varnish with a paint pad to help prevent foaming and air bubbles.**

replaced with water. Typically they cure in two stages, first releasing water, then curing by solvent evaporation, polymerization, or a combination of the two. Most waterbornes spray nicely and can also be brushed, though for flat surfaces, I prefer using a paint pad.

### Oil Varnish

Though it can be made in many ways, oil varnish is essentially a mixture of a drying oil and a resin. Drying oils, often nut oils, will dry to a solid when exposed to oxygen. The resin can be natural (elemi, colophony, pontianak, kauri) or synthetic (alkyd, urethane). The resin has little effect on the drying, but does affect the durability of the finish. Urethane or polyurethane varnish (the terms are used interchangeably) has the highest degree of both heat and abrasion resistance of all the common oil varnishes.

*Scrub the varnish onto the wood with a white or gray Scotch-Brite® pad, then wipe it off thoroughly with paper shop towels or rags.*



### How It Cures

Irrelevant of the resin, oil finish cures when oxygen, drawn from the air, bonds the oil molecules together. As they go from small to much larger molecules, the varnish goes from liquid to solid. Formulators often add driers which act as a catalyst to speed up the curing time of the oil.

### Exterior vs. Interior

Wood left outdoors goes through more intense humidity changes than wood indoors. Thus, the wood moves more and therefore needs a more flexible finish.

In addition to being more flexible, exterior varnish

must withstand more intense UV light bombardment, and it must be formulated accordingly.

Traditional spar varnish is a mixture of tung oil and phenolic resin, two components that naturally resist breaking down in UV light. When it does deteriorate, it tends to degrade from the top down, getting chalky on the surface. Sand off the chalkiness and you can reapply more coats again and again without ever stripping the finish. Sadly, that's not necessarily true of some modern varnishes called spar varnish, which is why you need to read the ingredients.

### Application

All oil varnishes can be applied the same way, and while most can be sprayed, there are two methods of application I find to be the best. The easiest is to flood the surface with varnish and wipe off the excess. Each coat is applied the exact same way.

Scrub the finish onto the wood with white or gray

*Continues on page 84 ...*

### Contact us

with your finishing questions by writing to Woodworker's Journal, 4365 Willow Drive, Medina, MN 55340, or by emailing us at: [finishing@woodworkersjournal.com](mailto:finishing@woodworkersjournal.com).

Please include your address, phone number and email address (if you have one) with your thoughts or questions.



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# Finishing Thoughts continued

## Four Tips for a Tip-Top Brushed Finish



**1** One of the first steps in brushing on varnish is to soak the brush up to the ferrule in thinner, then squeeze out the excess.



**2** Dip only the last third of the bristles into finish, then gently touch only the tips to the flat edge of the pan (inset). That will prevent dripping without unloading the brush.



**3** Starting just in from the edge, deflect the brush so varnish rises to the top of the bristles, then gently slide the brush out from under the finish, increasing deflection as you go.



**4** After unloading the brush, hold it at 90° and gently drag just the bristles' tips through the still-wet varnish to remove air bubbles and brush marks.

nylon abrasive pads as applicators and wipe off with paper shop towels. Apply one coat per day. By morning, the finish will be cured enough so that the subsequent coat won't damage the previous coat. It goes on smoothly even in a dusty environment, but does build slowly. While each coat takes only minutes to apply, a thick coating will require many coats.

### Brushing Varnish

Choose a soft bristle varnish brush, like an ox-hair blend. Put some mineral spirits in one pan and any oil varnish, reduced 10 percent or so, in the other. Make sure the pan has at least one flat side.

Soak the brush up to the ferrule in thinner, and squeeze out the excess.

Hold the brush by the ferrule so the bristles are extensions of your fingers.

Dip only the last third of the bristles into finish, then gently touch only the tips to the flat edge of the pan. That will prevent dripping without unloading the brush.

Starting just in from the edge, deflect the brush so finish rises to the top of bristles. Gently slide the brush out from under the finish, deflecting more as you go. Ease up at the end, then go back and blend the start to the edge of the wood.

As finish starts to thicken on the brush or creep up toward the ferrule, stop and quickly rinse the brush in thinner, squeeze it out and continue with a rejuvenated brush. When the entire area is coated, scrape the bristles over the edge of the pan to unload them.

Holding the still-wet brush at 90°, gently drag just the tips of the bristles through the finish to blend out brush marks and remove air bubbles.

If you regularly rinse the brush as you work, it will be very easy to clean once you are done and help keep the bristles supple. You can watch both the brushing on sequence and cleaning the brush in action in the "More on the Web" online video associated with this article.

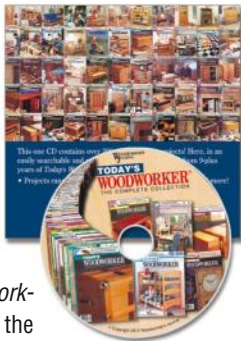
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Cedar	4/4	1C+Btr	2.00						4/4	\$ 87.00	8/4	NA
Cherry	4/4	1C	2.75	Select	4.90	8/4		5.75	4/4	\$126.00	8/4	\$139.00
Cypress	4/4			Select	3.00	8/4		4.00	4/4	\$ 99.00	8/4	\$109.00
Hickory-Pecan	4/4	1C	2.00	Select	3.00	8/4	Select	3.50	4/4	\$110.00	8/4	\$137.00
Mahogany (African)	4/4			Select	5.25	8/4	Select	5.55	4/4	\$124.00	8/4	\$127.00
Maple (Hard)	4/4	Select (N)	3.00	Select (W)	3.65	8/4	Select	4.50	4/4	\$118.00	8/4	\$126.00
Maple (Soft)	4/4			Select	2.60	8/4	Select	3.00	4/4	\$ 97.00	8/4	\$107.00
Oak (Red)	4/4	1C	2.10	Select	2.80	8/4	Select	3.95	4/4	\$107.00	8/4	\$129.00
Oak (White)	4/4	1C	2.20	Select	2.80	8/4	Select	4.95	4/4	\$107.00	8/4	\$135.00
Poplar	4/4	1C	1.30	Select	1.80	8/4	Select	2.00	4/4	\$ 87.00	8/4	\$ 91.00
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# HEY Did You Know?

## Woodworking trivia: a depth of knowledge

**Well rooted:** Although their roots can penetrate the ground to a depth equivalent to three times the height of a tree, usually about **90% of the tree's roots** are in the top foot and a half of the soil.



## What Does It All Mean?

A quick guide to terms from the world of woodworking.

**Mortiser:** A machine similar to a drill press but with a hollow, square chisel surrounding the drill bit, used to cut square or rectangular cavities, known as mortises, in wood

**S4S:** Lumber that has been surfaced on all four sides

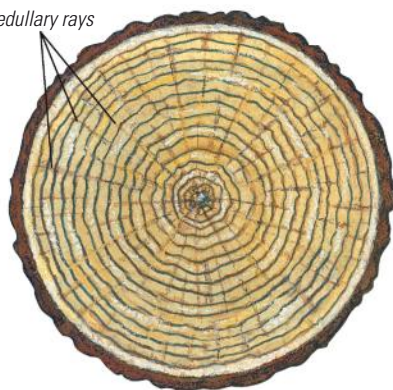
**Sliding dovetail:** A form of joinery similar to a dado but with angled rather than vertical sides and a mating piece shaped along its edges at a corresponding angle

Curiously, although **sandpaper** in some form goes back **2,000 years** to first century China, most of its development has taken place in the last 200 years. Once made of natural grits, today most papers contain various synthetic grits.



Digital image courtesy of unkas\_photo/Bigstock.com

Medullary rays



**Medullary rays** are the structures in wood that radiate from the pith of a stem outward to the bark. They align vertically to the annual rings and cause the attractive figure seen on quartersawn woods such as oak and sycamore.

## Submit your own trivia ...

**Send in a curious fact about your favorite topic and ours: woodworking. If it is selected for use, you will win an awesome prize!**

Submit your Trivia to Woodworker's Journal, Dept. Trivia, 4365 Willow Drive, Medina, MN 55340. Or send us an email: [trivia@woodworkersjournal.com](mailto:trivia@woodworkersjournal.com)

## Your Trivia Test:

**Q** What time of year is latewood formed?

**Answer** Latewood growth rings are formed in late summer. They are darker than the earlywood growth rings from spring.



Ed Stoller of Monticello, Illinois, will receive a **BESSEY K BODY REVO Parallel Clamp Kit** for having his contribution selected for the Trivia page.

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The Freud logo is displayed in a red, stylized font within a black octagonal border. In the background, a CNC router bit is shown carving a complex, interlocking geometric pattern into a piece of light-colored wood.

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